OCTOBER, 1954

PIPE LINE INDUSTRY

© Gulf Publishing Company

CONSTRUCTION • OPERATIONS • MAINTENANCE

Gulf Interstate . . . . . completing . . . . . .

. . New Streamlined Pipe Line System

a triumph in modern pipelining
Page 62

•

El Paso Natural . . . . . solves . . . . . .

. . The Case of the Misbehaving Bridge

a pipe line span that heaved in the gentle breeze . Page 43

Turn Page for additional contents and a Quick Review of this issue

THE LIBRARY OF CONGRESS SERIAL RECORD
OCT 14 1954

Subscription price $2 per year

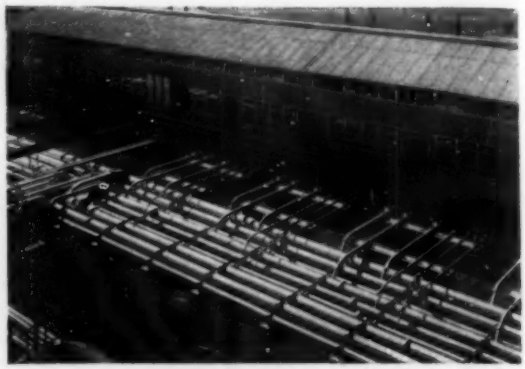
Single copy price 50 cents

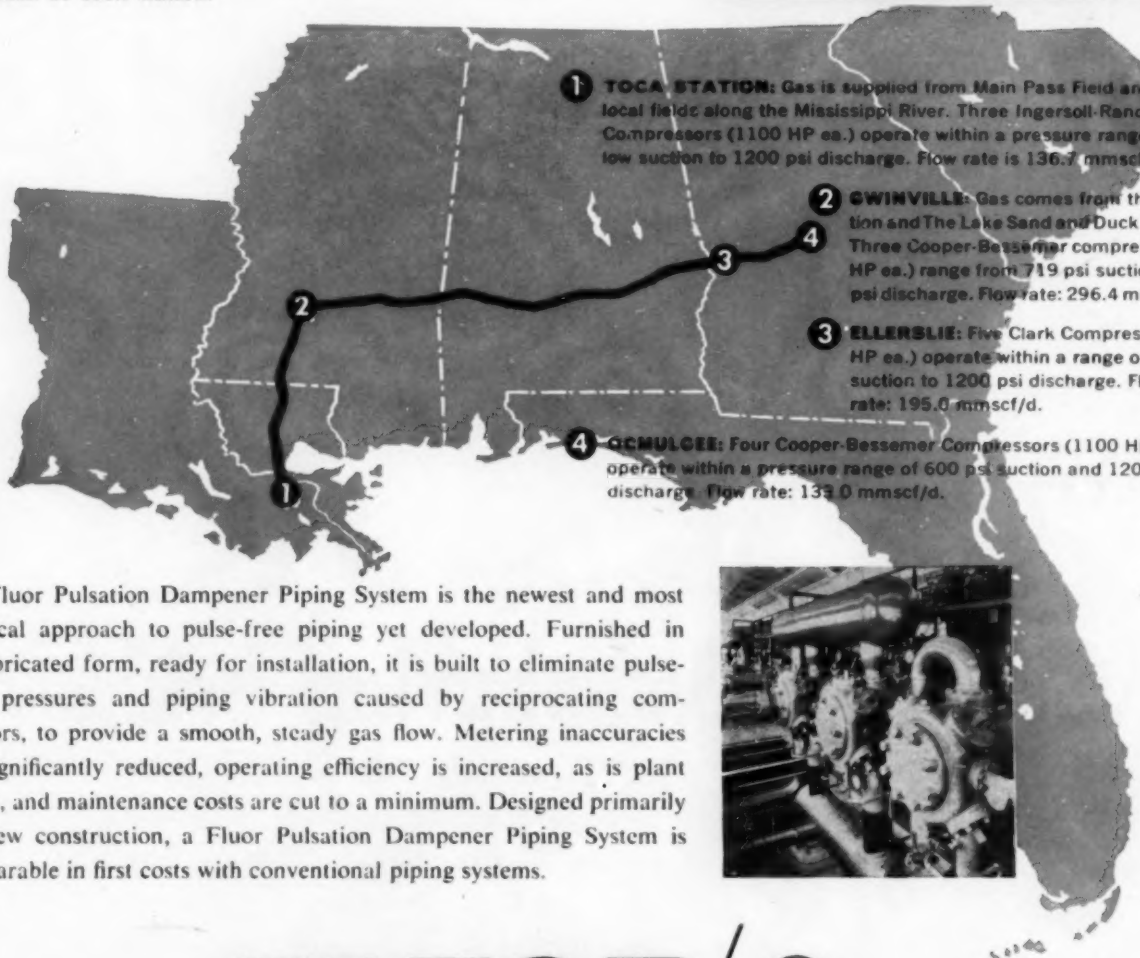
Designed to stop compressor-plant vibration–

Fluor pulsation dampener piping systems

have been installed by Southern Natural Gas in 4 new compressor stations

Southern Natural Gas Company has added four new compressor stations on their high pressure gas transmission system, which begins in Southern Louisiana and crosses the states of Mississippi, Alabama, Georgia, and extends into South Carolina. The company installed complete prefabricated Fluor Pulsation Dampening Systems in the four stations. A Fluor Pulsation Dampening Piping System had previously been installed at their Logansport, Louisiana, unit in 1952. Each new station has engines operating at a maximum of 1200 psi discharge under different conditions. The Fluor piping systems were individually designed, engineered and built into complete units to satisfy the specific conditions of each station.




1 TOCA STATION: Gas is supplied from Main Pass Field and other local fields along the Mississippi River. Three Ingersoll-Rand Compressors (1100 HP ea.) operate within a pressure range of 600 psi low suction to 1200 psi discharge. Flow rate is 136.7 mmscf/d.
2 GWINVILLE: Gas comes from the Toca station and The Lake Sand and Duck Lake Fields. Three Cooper-Bessemer compressors (1350 HP ea.) range from 719 psi suction to 1200 psi discharge. Flow rate: 296.4 mmscf/d.
3 ELLERSLIE: Five Clark Compressors (1100 HP ea.) operate within a range of 600 psi suction to 1200 psi discharge. Flow rate: 195.0 mmscf/d.
4 OCMULGEE: Four Cooper-Bessemer Compressors (1100 HP ea.) operate within a pressure range of 600 psi suction and 1200 psi discharge. Flow rate: 133.0 mmscf/d.

The Fluor Pulsation Dampener Piping System is the newest and most practical approach to pulse-free piping yet developed. Furnished in prefabricated form, ready for installation, it is built to eliminate pulse-peak pressures and piping vibration caused by reciprocating compressors, to provide a smooth, steady gas flow. Metering inaccuracies are significantly reduced, operating efficiency is increased, as is plant safety, and maintenance costs are cut to a minimum. Designed primarily for new construction, a Fluor Pulsation Dampener Piping System is comparable in first costs with conventional piping systems.

BE SURE WITH **FLUOR**

THE FLUOR CORPORATION, LTD
LOS ANGELES 22, CALIFORNIA
FLUOR OF CANADA · TORONTO
FLUOR INTERNATIONAL · BEIRUT
FLUOR PERUANA, S. A. · LIMA
HEAD WRIGHTSON · LONDON

ENGINEERS
CONSTRUCTORS
MANUFACTURERS

NEW YORK
CHICAGO
PHILADELPHIA
BOSTON
PITTSBURGH
SAN FRANCISCO
HOUSTON
BIRMINGHAM
TULSA

FOR MORE INFORMATION *on the full advantages of this guaranteed piping system, write for Bulletin PDS-8501.*

OCT 13 1954

PIPE LINE INDUSTRY

CONTENTS and Quick Review

October, 1954 Vol. 1, No. 4

To help you put first things first, scan these time-saving digests, checking ☑ those you want to read first.

Rumors Can Ruin You

☐ Riots have been started, banks closed and companies crippled because somebody whispered a vicious word. There's the Bogey rumor, the Pipe Dream rumor and the Hate rumor, equally dangerous to your company. Learn to forestall them.

By Auren Uris ..... Page 38

Summer Jobs With a Future

☐ A plan which benefits both college students and the company has been adopted by Texas Gas Transmission Corporation. Students hired for summer work are given on-the-job training, evaluated for performance and offered permanent employment upon graduation if their work is satisfactory. The student gets a crack at a job and the company provides itself with a source of future employes.

Page 40

New System Speeds Up Oil Run Ticket Audit

☐ Service Pipe Line Company is using a method which automatically transmits oil run ticket information from field headquarters in a fraction of the time previously required by manual means. Here's an explanation of how the system works.

By C. B. Carsten ..... Page 41

The Case of the Misbehaving Bridge

☐ The aerial pipe line bridge across the Colorado River was threatening to "shake itself to death." With clock-like regularity, starting late in the afternoon, undulations would sweep across the bridge at approximately three-second intervals. The heave was measured at six feet. Only the faintest breeze was blowing. Higher winds seemed to have a dampening effect on the vibrations. What was the answer?

By Bill Bridges ..... Page 43

Bulldozer Doubles as Crane

☐ Something new in the pipe line industry is a jack-of-all-trades bulldozer that can bulldoze, tow and double as a crane. The topping lift and load line on the crane boom can be operated very much like the ordinary sideboom. Although this newcomer won't replace the sideboom, bulldozer, tow cat or crane, it is expected to find application in many pipe line construction jobs.

Page 46

Horizontal Two-Phase Oil and Gas Flow

☐ Two-phase flow of oil and gas in a single horizontal pipe line is receiving an increasing amount of attention from the pipe line industry, as oil and gas reserves are discovered off the Gulf Coast. Here's a report on experimental studies along these lines.

Frederick N. Schneider, Philip D. White and R. L. Huntington ..... Page 47

Dehydration of Light Hydrocarbon Liquids

☐ Because of the advances in design of equipment and instrumentation, it is necessary to evaluate carefully the method used to dehydrate light hydrocarbon liquids for products pipelining. This month PLI presents the first of a three-part article which describes regeneration methods and distillation drying and testing for water content.

By John M. Campbell ..... Page 52

How Portable Pump Units Were Converted To Highly Efficient Main Line Stations

☐ Never change lube oil! Interstate Oil Pipe Line Company has decided it's not necessary at their new stations in Louisiana. Not only that, but the operators do not filter, centrifuge, or treat the oil. Pumping units are high-speed, skid-mountable and portable. Originally they were purchased for temporary service. But they performed so well, the company decided to use them in permanent stations.

By William Law ..... Page 56

Gulf Interstate's New Streamlined System

☐ Record-breaking progress was made in the construction of Gulf Interstate Gas Company's 1160-mile-long system that runs from Louisiana to eastern Kentucky. Good line location, fast purchase of right-of-way, and dry weather all combined to make it possible.

• Emergency repair kit developed by Gulf Interstate engineers is one of the most ingenious devices to come along in years. It is made up of short lengths of eight-inch pipe with quick-make couplings that enable pipeliners to place a blown-out section of line back in service in just a few hours regardless of terrain and weather.

• Push-button compressor stations of 8000 horsepower each will be operated by only one man on duty. Engines can be started, loaded, or stopped simply by flicking a switch or pushing a button. In addition to this feature, the stations are designed for minimum maintenance and high thermal efficiency.

By Donald M. Taylor ..... Page 62

Who's Meeting Where 37
Rules of Thumb for the Pipeliner's Notebook 55
You Asked About Corrosion ..... *Marshall E. Parker* 61
How to Do It—Pipe Line Hints 88
What's Happening in Pipe Line Construction 93
PIPE LINE INDUSTRY's Views of the News 98
Pipe Line Men in the News 106
What's Happening Among Service and Supply Men 110
What's New in Equipment 114
ADVERTISERS' INDEX 120

Oil Progress Week Important to All

The American petroleum industry will celebrate Oil Progress Week October 10 to 16. Although this is the seventh annual Oil Progress Week, it is just as important as any of the preceding observances.

Much has been accomplished since the industry organized a widespread public relations program with the creation in 1947 of the Oil Industry Information Committee (OIIC), sponsored by the American Petroleum Institute. However, much remains to be done. Too many people still have too many misconceptions about the oil business. This is not surprising, as public information programs of this kind must be continuing, long-range undertakings. Education always must be a never ending effort.

•

The purpose of Oil Progress Week is to give the American people a better understanding of what the industry does and how it does it. The overall theme for the 1954 observance is oil competition and how this competition serves American consumers.

Thousands of oil men will participate in the many events. Hundreds of speeches will be made at business and civic luncheons and other gatherings. In addition, there will be special radio and television shows, exhibits, displays, open houses, parades and special editions of newspapers.

•

Everyone in the oil business should get behind this program. This is the only way to make it really effective. The responsibility does not belong just to members of the OIIC, nor to company officials and public relations men. It is a responsibility of all who believe in the American way of life.

It is easy to participate in the industry's public relations program. Pamphlets, booklets and other special materials prepared by OIIC are readily available. They provide sufficient background data on the progress, operating nature and achievements of the industry to enable anyone to make a speech or intelligently discuss how oil competition serves the American public.

Something like 1¾ million people are employed in the oil industry of the U. S. What they say to their families, friends and acquaintances carries greater weight than anything they see in print or hear over the radio. So every oil man and woman, from bigwig to stenographer and clerk, should start talking shop for all he or she is worth.

Therefore, Oil Progress Week also affords oil companies a golden opportunity to better educate their own employes. Distribution of some of the OIIC material will make good-will ambassadors of many employes.

•

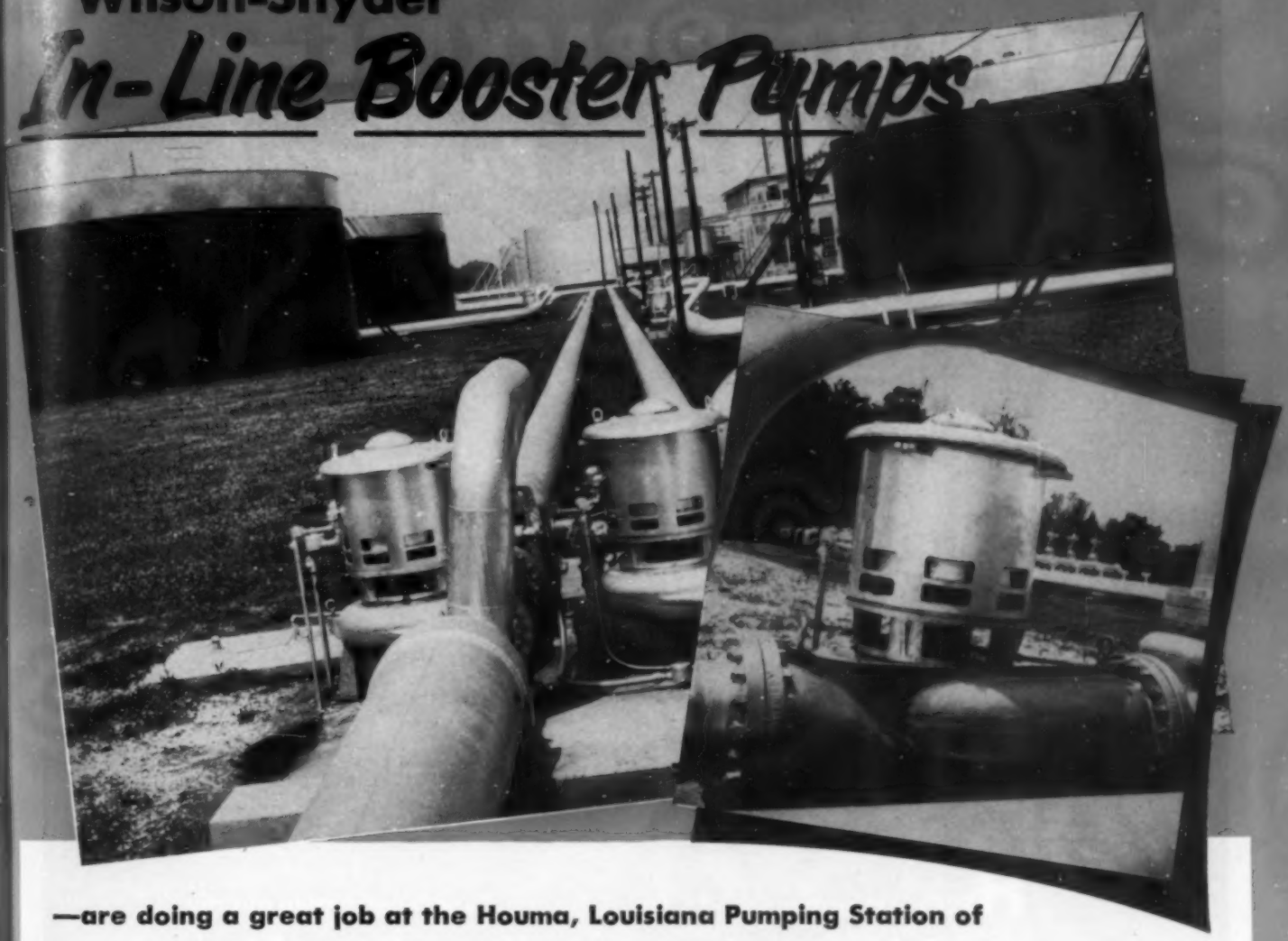
The job before American business, of which oil is an important segment, is to inform the American people as to just why the American competitive economic business freedom is important to this country. As more people gain a better understanding of the oil industry, their appreciation of the significant part it plays in their lives will grow.

This will enable the public to understand how and why a privately-owned, competitive and enterprising petroleum business best serves the American interest. Understanding this, the public will be in a better attitude and position to defend the economic freedom which has made America great.

Oil has a wonderful story to tell. Everyone in the oil business should be proud to tell it at every opportunity.

Warren L. Baker

Wilson-Snyder
In-Line Booster Pumps...



—are doing a great job at the Houma, Louisiana Pumping Station of

THE TEXAS PIPE LINE COMPANY

THE SYSTEM for transporting crude oils from the Terrebonne Bay area of Louisiana to Port Arthur, Texas, presented some unusual engineering problems, according to the engineering department of The Texas Pipe Line Company. (See WORLD OIL publication, p. 249, August, 1952 and p. 258, September 1952.)

WILSON-SNYDER IN-LINE CENTRIFUGAL PUMPS proved a most effective solution to the problem of permitting the main line pumps to maintain full capacity regardless of tank heads and different grade crudes handled. In emergencies, main line pumps can even be by-passed, as the IN-LINE PUMPS are capable of developing adequate pressure for direct deliveries to the main line at reduced flow rates.

Suction head varies for these IN-LINE PUMPS as oil levels decrease in tanks. The crude oil handled also varies from 29 to 39 A.P.I. gravity but neither of these factors have decreased the effectiveness of pump performance, according to The Texas Pipe Line Company's operating department.

Nine of these pumps are installed at the company's Houma station and four more are in operation at Erath. Each pump is operated individually by remote control, is designed for 16" connections with vertical-electric motor, and has capacity rating of 244,800 barrels per day. These units are suitable for outdoor installations and are designed to cope with all climatic conditions encountered in Gulf Coast areas.

WHEN YOU . . . have pumping applications that demand reliable performance, refer your problems to "OILWELL" for tailored-for-the-job engineering. "OILWELL" Sales Representatives everywhere will gladly help you . . . GET THE FACTS.

OIL WELL SUPPLY
DIVISION
UNITED STATES STEEL CORPORATION

Executive Offices—DALLAS, TEXAS
Export Office—
30 ROCKEFELLER PLAZA
NEW YORK 20, N. Y.

Area Offices—
CALGARY, CANADA
CASPER, WYOMING.....COLUMBUS, O.
DALLAS, TEXAS.....HOUSTON, TEXAS
TULSA, OKLA.....LOS ANGELES, CALIF.

Branches Serving All Oil Fields

USS TRADE MARK

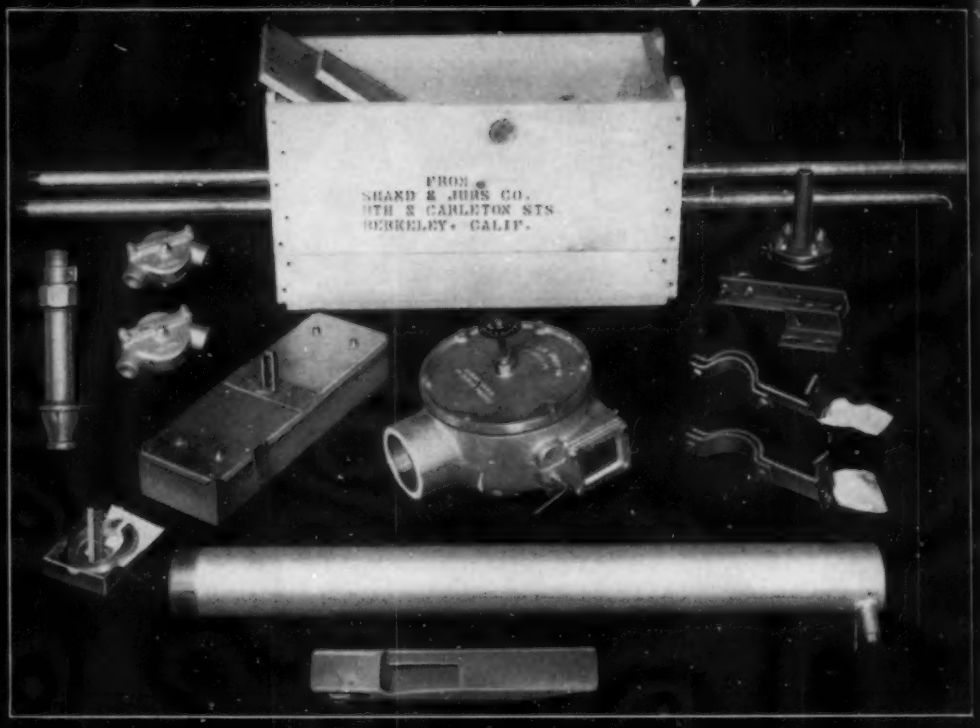
"OILWELL"

TRADE MARK

UNITED STATES STEEL

1954

A COMPLETE PACKAGE—
No Extras to Buy!



HERE is a complete Shand & Jurs Automatic Gage for mounting directly onto bolted stock tanks. Everything needed for immediate installation is supplied in one package. There's absolutely nothing more to buy before putting this S&J Automatic tank gage into operation.

The bracket flanges are drilled and ready for mounting on the bolts already on the stock tank. Even the pipe, cut to length for 16' 1" high bolted stock tanks. is supplied.

Designated by S&J as Fig. ST-2935, this is the same high quality S&J Automatic Tank Gage that has earned its reputation for maximum dependability and accurate measurement through years of service in the field. Now you can equip your bolted stock tank with an automatic S&J tank gage, supplied complete in one delivery.

Shand and Jurs Co.
BERKELEY 10, CALIFORNIA

NEW YORK
342 Madison Ave.

CHICAGO
10409 S. Western Ave.

HOUSTON
M & M Bldg.

TULSA
Thompson Bldg.

LOS ANGELES
714 W. Olympic Blvd.

REPRESENTATIVES:
SEATTLE: Nebar Supply Company, 3000 Western Avenue
MONTREAL: Lytle Engineering Specialties, Ltd., 360 Notre Dame St., W
TORONTO: Lytle Engineering Specialties, Ltd., 85 Richmond St., W.
VANCOUVER: P. D. McLaren & Son, Ltd., 3277 Main Street
CARACAS: Sinclair Spence, C.A., Edificio Galipan
ENGLAND: Whessoe, Ltd., Sales: 25 Victoria St., London, S.W. 1
Whessoe, Ltd., Works: Darlington, County Durham

PIPE LINE INDUSTRY

Specialized oil publications of **THE GULF PUBLISHING COMPANY**, 3301 Buffalo Drive, Houston 6, Texas; Box 2608, Houston 1, Texas.

PIPE LINE INDUSTRY for the oil and gas pipe line industry.

WORLD OIL and **THE COMPOSITE CATALOG** for the drilling-producing-pipe line industry.

PETROLEUM REFINER and **THE REFINERY CATALOG** for the refining-natural gasoline-petrochemical industry.

•

RAY L. DUDLEY, President, Publisher

A. L. BURNS, Vice President, General Manager

•

EDITORIAL STAFF

Warren L. Baker, Editorial Director; Donald M. Taylor, Editor; Al Reese, Managing Editor; Cecil W. Smith, Don Kliewer, Wallace Fitzgerald, William G. Dudley, Associate Editors.

District Editors: Robert E. Spann, 250 Park Ave., New York 17, N. Y.; Gilbert M. Wilson, W. W. Wilson Building, Huntington Park, Calif., and Anthony Gibbon, Hunt Building, Tulsa 3, Okla.

Editorial Assistant: Mary Stuart Warren.

Librarian: Eunice Okoneski.

•

CIRCULATION DEPARTMENT

R. M. de Sombre, Manager.

•

ADVERTISING STAFF

Tom W. Nelson, Advertising Manager; Nelson Bigelow, Gene Hart, George Skelton, 250 Park Ave., New York 17, N. Y.; Bill Westfall, 1010 Euclid Ave., Cleveland 15, Ohio; H. G. Fitzpatrick, Martin Halloran, 332 S. Michigan Ave., Chicago 4, Ill.; Bill Atcheson, Hunt Building, Tulsa 3, Okla.; J. W. Curts, W. W. Wilson Building, Huntington Park, Calif.; Charles Wyatt, Clair Bryan, Jr., 3301 Buffalo Drive, Houston 6, Texas; D. S. Craig, Manager Advertising Service Department; Theodor Miocha, Limmerstrasse 31, Hannover, Germany, Foreign Representative.

•

Single copies 50 cents (except special issues). Subscription price: domestic and foreign, $2 a year; 2 years, $3; 3 years, $4. Subscription restricted to those engaged in the pipe line branch of the oil and gas industry, or the manufacturing and distribution of pipe line equipment.

PIPE LINE INDUSTRY, published every month. Entered as second class mail matter July 9, 1954, at the post office at Houston, Texas, under the act of March 3, 1879. Advertising rates on application.
Copyright, 1954, by The Gulf Publishing Company.

OTIS PRESSURE CONTROL · SERVICE · EQUIPMENT

if it's Otis' it's Expertly Engineered

Balanced Combination for Best Service

EXPERT ENGINEERING at Otis has developed the best and most extensive line of pressure control tools available from any single source. Nowhere in the industry is there assembled such an impressive group of mechanical and petroleum engineers who specialize in pressure control work. Nowhere is there more convincing evidence of expert engineering than Otis' own leadership in pressure control services and equipment.

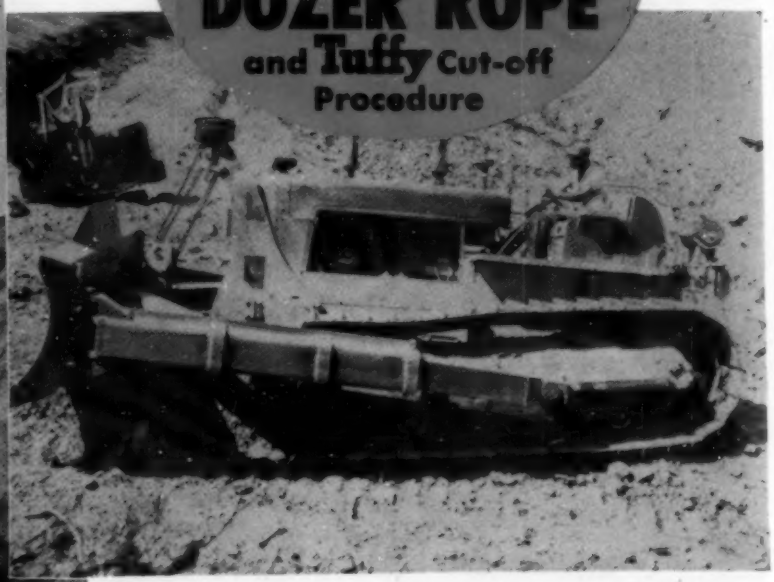
· Expert Engineering · Experience · Manufacturing
· Field Supervision · Research and Development
· Production Control · Inventory Control
· Coverage · Testing and Inspection

OTIS PRESSURE CONTROL, INC.

Use Dozer Rope You Now Throw Away!

Cut Costs with

Tuffy® DOZER ROPE and Tuffy Cut-off Procedure



Tuffy
Dragline
Maximum abrasive resistance, extra flexibility! Rides better on grooves, hugs drum when casting!

Tuffy
Slings
It's next to impossible to materially damage the 9-part machine-braided wire fabric construction of Tuffy Slings by kinking. For longer service with safety, buy Tuffy.

Tuffy
Hoist Line
Designed especially for hoist line use on cranes, clamshells and derricks. Flexible and tough.

Tuffy
Scraper Rope
Flexible enough to withstand sharp bends . . . stiff enough to resist looping and kinking when slack! Moves more yardage.

Specially designed for Dozer Use, Tuffy Dozer Rope has the stamina needed to keep on handling the blade long after ordinary ropes are worn out!

Mounted Back of The Wedge Socket, a 150′ reel of ½″ or 9/16″ Tuffy Dozer Rope can give greatly increased service! Here's how: When rope is cut or crushed on the drum you feed through just enough to replace the damaged part—save the 40′ to 50′ you now throw away!

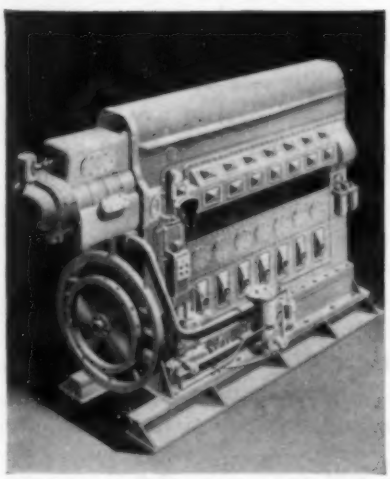
In Half The Time normally needed for replacement, your Dozer is back on the job! Remember, you needn't replace the whole rope. Just feed enough from the reel to replace the part that's damaged. Users report down-time reduced considerably when they install Tuffy!

Combine this built-in strength of Tuffy with the savings offered by the Tuffy Reel Mounting and Tuffy Cut-off Procedure and you'll see why more and more construction men are switching to Tuffy! Try Tuffy Dozer Rope—and *save* the difference!

union UNION WIRE ROPE CORP. *Wire Rope* **corporation**

2278 Manchester Ave. • Kansas City 26, Mo.

Specialists in High Carbon Wire, Wire Rope and Braided Wire Fabric



Fairbanks-Morse Model 38F 90—320 to 825 hp.

Here's fast-starting power for oil line pumping that doesn't quit till you say "whoa"...the Opposed-Piston Fairbanks-Morse Model 38F 90 diesel. Because the engine is delivered with all controls and accessories in place, you need only attach fuel and water lines and it's ready to go.

And fewer moving parts (40% less than you find in conventional diesels) are responsible for the O-P's low starting inertia and high availability, as well as making it the easiest engine to operate and maintain.

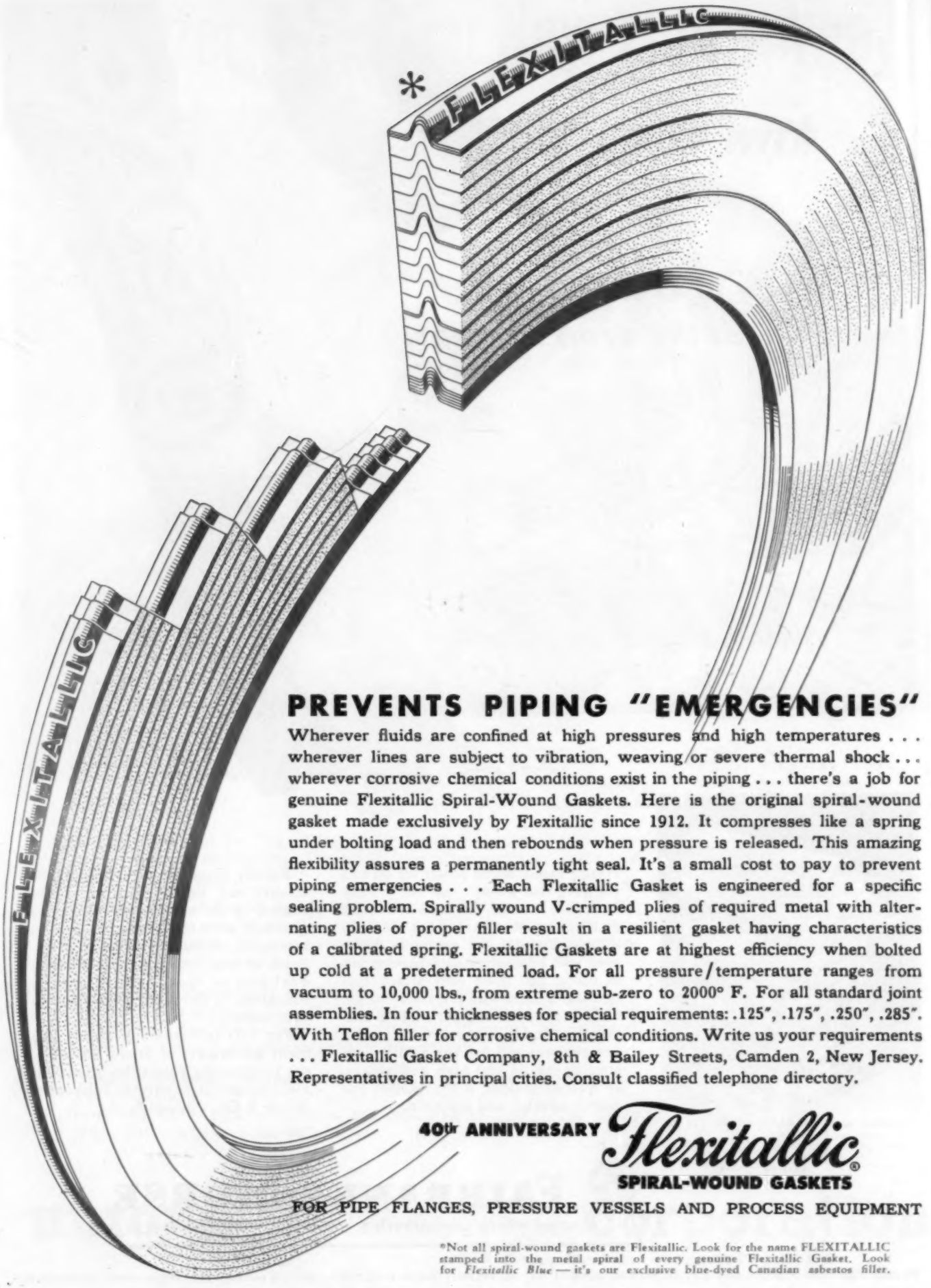
Equally important, the 38F is 20% smaller and lighter than any other engine in its horsepower range, to give you more heavy-duty power in less space. It has three-way fuel options, so that you can choose diesel, dual fuel or spark-ignited gas... whichever is the most economical in your locality.

For full information about the many advantages of Model 38F 90's, see your nearby Fairbanks-Morse Oil Field Specialist, or write to Fairbanks, Morse & Co., Chicago 5, Ill.

FAIRBANKS-MORSE

a name worth remembering when you want the best

OIL FIELD EQUIPMENT • PUMPS • SCALES • ELECTRIC MOTORS • GENERATORS • LIGHT PLANTS • DIESEL, DUAL FUEL & GASOLINE ENGINES • MAGNETOS • DIESEL LOCOMOTIVES



PREVENTS PIPING "EMERGENCIES"

Wherever fluids are confined at high pressures and high temperatures . . . wherever lines are subject to vibration, weaving or severe thermal shock . . . wherever corrosive chemical conditions exist in the piping . . . there's a job for genuine Flexitallic Spiral-Wound Gaskets. Here is the original spiral-wound gasket made exclusively by Flexitallic since 1912. It compresses like a spring under bolting load and then rebounds when pressure is released. This amazing flexibility assures a permanently tight seal. It's a small cost to pay to prevent piping emergencies . . . Each Flexitallic Gasket is engineered for a specific sealing problem. Spirally wound V-crimped plies of required metal with alternating plies of proper filler result in a resilient gasket having characteristics of a calibrated spring. Flexitallic Gaskets are at highest efficiency when bolted up cold at a predetermined load. For all pressure/temperature ranges from vacuum to 10,000 lbs., from extreme sub-zero to 2000° F. For all standard joint assemblies. In four thicknesses for special requirements: .125", .175", .250", .285". With Teflon filler for corrosive chemical conditions. Write us your requirements . . . Flexitallic Gasket Company, 8th & Bailey Streets, Camden 2, New Jersey. Representatives in principal cities. Consult classified telephone directory.

40th ANNIVERSARY *Flexitallic*®

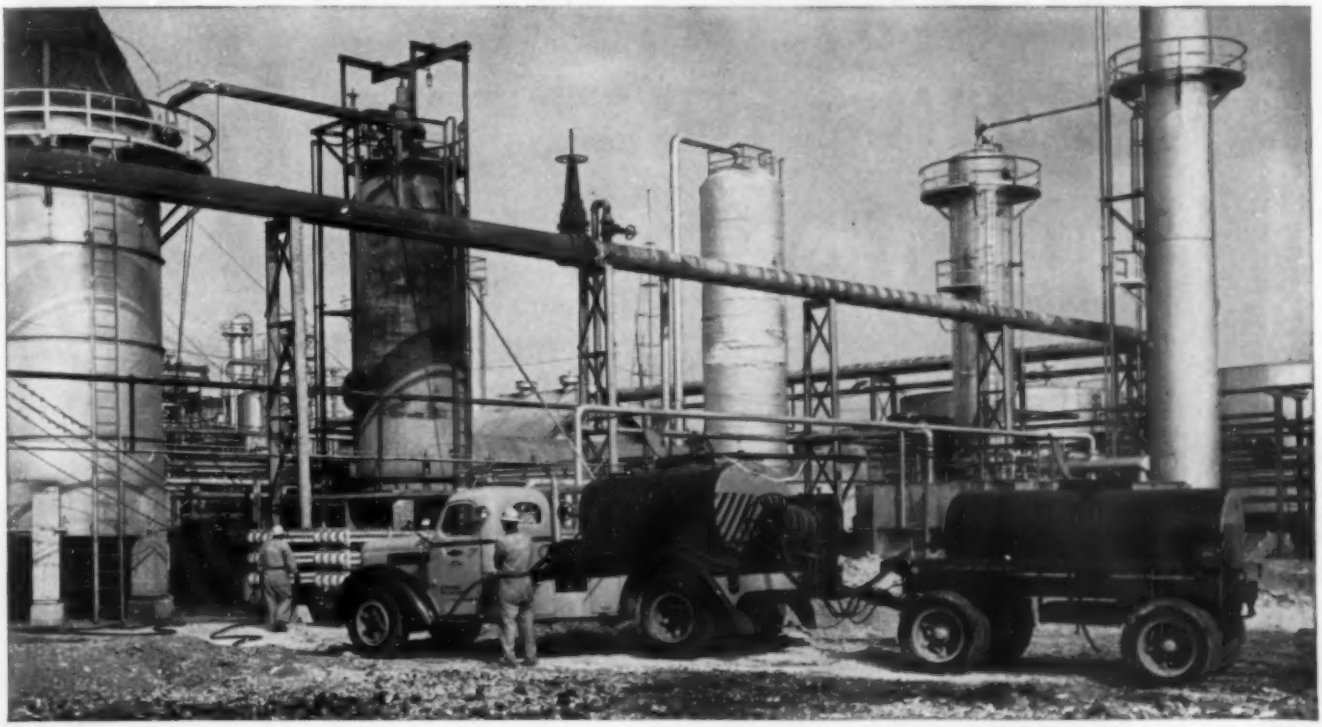
SPIRAL-WOUND GASKETS

FOR PIPE FLANGES, PRESSURE VESSELS AND PROCESS EQUIPMENT

*Not all spiral-wound gaskets are Flexitallic. Look for the name FLEXITALLIC stamped into the metal spiral of every genuine Flexitallic Gasket. Look for *Flexitallic Blue* — it's our exclusive blue-dyed Canadian asbestos filler.

5-MILE LPG LINE CLEANED BY DOWELL IN 12 HOURS

Chemical cleaning restored 200 pounds of pressure lost through scale-choked butane line



A pressure drop of about 200 pounds, due to scale accumulation in a butane line, was increasing pumping costs. The 2½-inch buried line carries butane from a refinery to a butadiene plant five miles away. Dowell Service cleaned the line in 12 hours—*without dismantling or digging*. The results: original discharge pressure was restored . . . the line was metal-clean . . . the workload on equipment handling the butane was lessened, netting the operator a considerable saving.

Dowell engineers took specially prepared solvents in truck-mounted tanks right to the job. They applied the chemicals through regular connections using Dowell-designed equipment, which includes all necessary pumps and control devices.

This is but one example. There are countless others where Dowell provided the practical solution to tricky maintenance cleaning problems. Dowell Service is designed to clean process lines, heat exchangers, tanks and many other pieces of industrial equipment. No special scaffolding is required. Dismantling and downtime are kept to a minimum.

Solvents are applied by Dowell engineers according to the techniques demanded by the job—jetting, filling, spraying, cascading or vaporizing. These liquid chemicals go wherever steam and water flow, reaching surfaces inaccessible to other methods.

You can discuss your cleaning problems fully, simply by calling a Dowell engineer. He will be happy to make cost estimates—no obligation, of course. For more facts about Dowell Service, call your nearest Dowell office. Or, if you prefer, write directly to Tulsa, Dept. J-59

DOWELL SERVICE

Over 130 Offices to Serve You with Chemical Cleaning for:

Boilers • Condensers • Heat Exchangers • Cooling Systems
Pipe Lines • Piping System • Gas Washers • Process Towers
Process Equipment • Evaporators • Filter Beds • Tanks

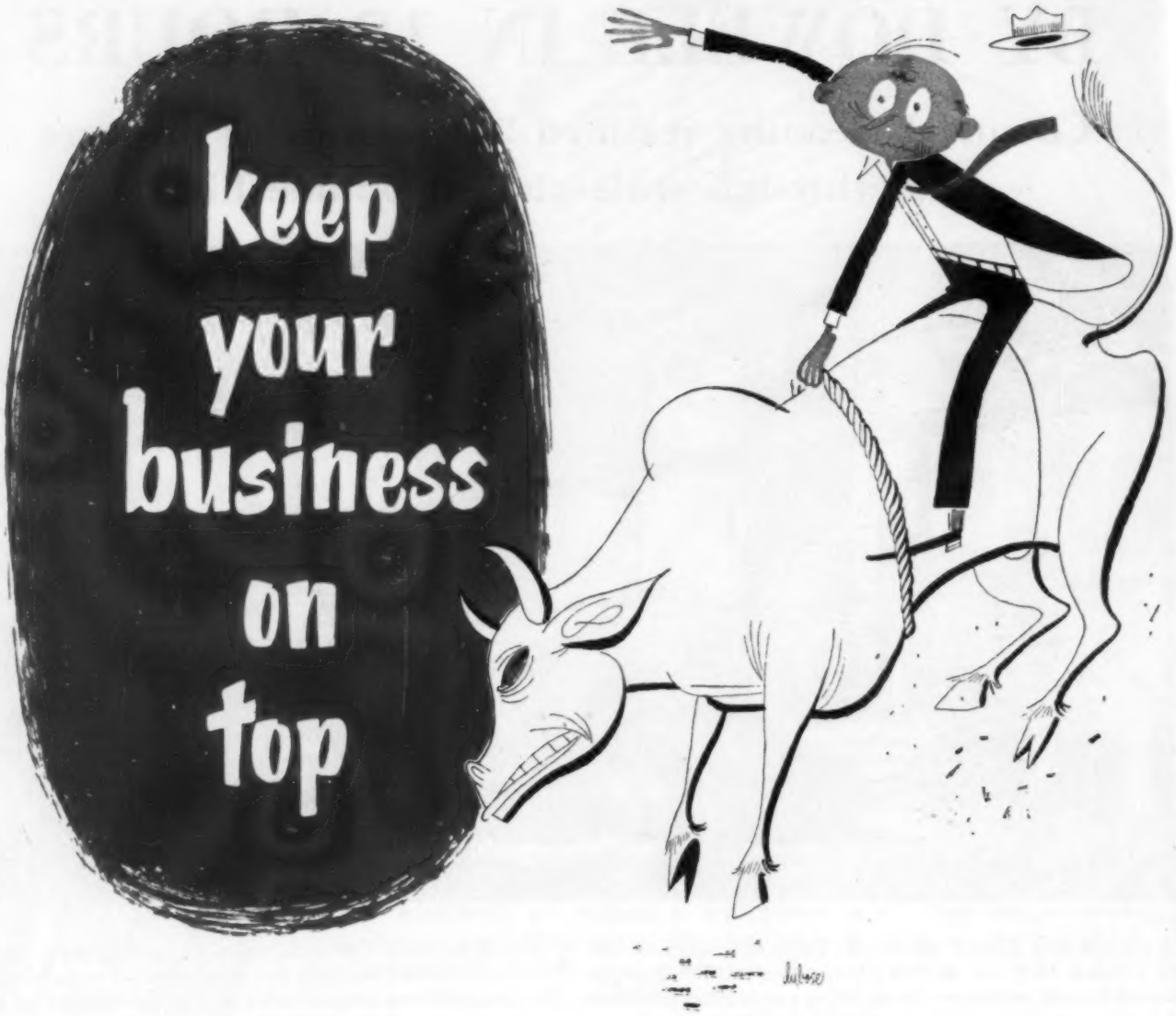
Chemical Services for Oil, Gas and Water Wells

DOWELL INCORPORATED • TULSA 1, OKLAHOMA

DOWELL

A Service Subsidiary of
THE DOW CHEMICAL COMPANY

For more data on advertised products, use Readers' Service Cards, last page.



Expert financial counsel is a must
for the successful continuation of a business.
At The National Bank of Commerce officers actually work for each of our
industrial depositors, using their accumulated, specialized
financial experience to help you. This expert guidance is at your service when
you make The National Bank of Commerce the bank for your company.
So, keep your business riding smoothly by taking advantage
of the broad experience of The National Bank of Commerce of Houston.

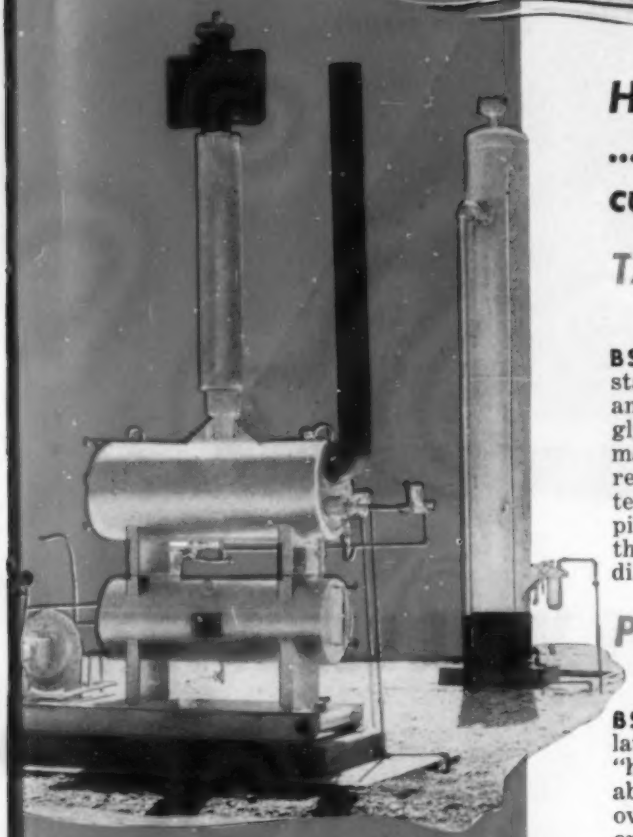
THE NATIONAL BANK OF COMMERCE

OF HOUSTON

Gulf Building, Houston, Texas "The Bank for All the People"

MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

Are YOUR Gas Lines and Equipment Adequately Protected Against "Freeze-Ups" This WINTER?



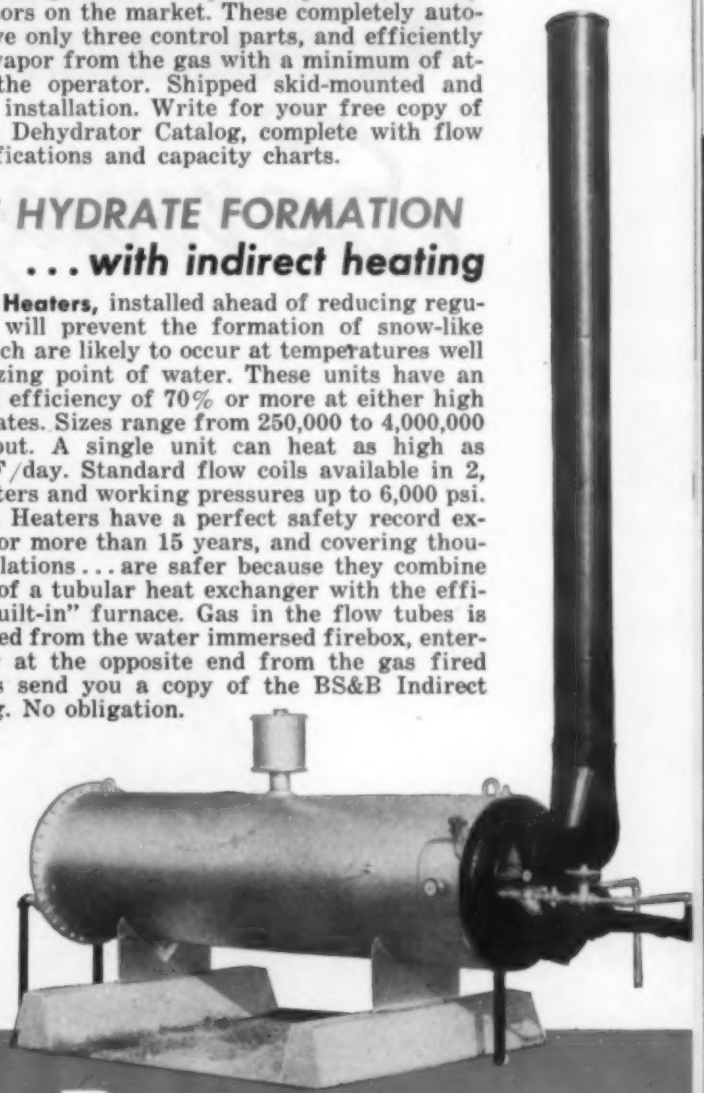
Here are TWO ways to "Beat the Freeze" ...and assure uninterrupted service to your customers under any operating conditions!

TAKE OUT THE WATER
...with glycol dehydration

BS&B Glycol Dehydrators are especially suited for installation on natural gas transmission lines, and are guaranteed to give the greatest dew point depression of any glycol dehydrators on the market. These completely automatic units have only three control parts, and efficiently remove water vapor from the gas with a minimum of attention from the operator. Shipped skid-mounted and piped for easy installation. Write for your free copy of the BS&B Gas Dehydrator Catalog, complete with flow diagram, specifications and capacity charts.

PREVENT HYDRATE FORMATION
...with indirect heating

BS&B Indirect Heaters, installed ahead of reducing regulator stations, will prevent the formation of snow-like "hydrates" which are likely to occur at temperatures well above the freezing point of water. These units have an overall thermal efficiency of 70% or more at either high or low firing rates. Sizes range from 250,000 to 4,000,000 BTU/hour input. A single unit can heat as high as 40,000,000 SCF/day. Standard flow coils available in 2, 3 and 4" diameters and working pressures up to 6,000 psi. BS&B Indirect Heaters have a perfect safety record extending back for more than 15 years, and covering thousands of installations... are safer because they combine the adantages of a tubular heat exchanger with the efficiency of a "built-in" furnace. Gas in the flow tubes is completely sealed from the water immersed firebox, entering the heater at the opposite end from the gas fired burner. Let us send you a copy of the BS&B Indirect Heater Catalog. No obligation.



EFFICIENCY **BS&B** RELIABILITY
OVER 60 YEARS

BLACK, SIVALLS & BRYSON, INC.

Oil and Gas Equipment Division, Dept. 1-EP10 • 1708 West Main St., Oklahoma City, Oklahoma

Serving ... **WORLD-WIDE** ...

THE CONTINENTAL SUPPLY COMPANY, *General Offices:* DALLAS, TEXAS

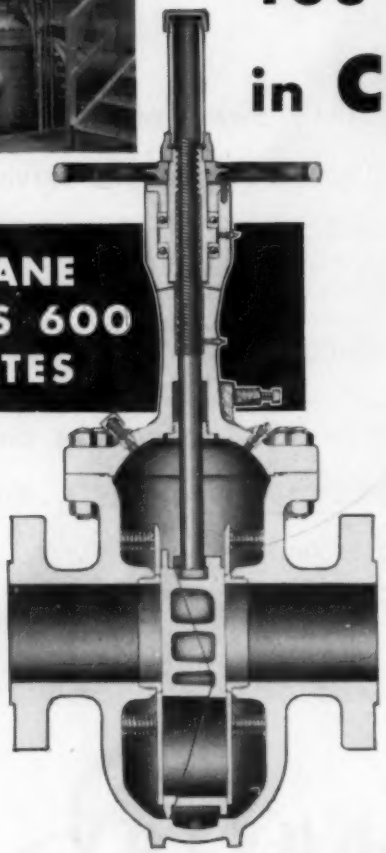
Continental representatives are constantly aware of the Pipe Line industry's many needs and how best to meet them. The services of these men in the field are augmented by a staff of experienced engineers familiar with Pipe Line construction and operation . . . men who take a practical approach in studying customer requirements.

This service — on a world-wide basis — supports the distribution of equipment and supplies unsurpassed in quality . . . through Continental's strategically located stores and offices.

.....THE PIPE LINE INDUSTRY

REPRESENTATIVES IN ALL PRINCIPAL OIL FIELDS OF THE WORLD

You get long-run quality in CRANE pipeline valves



CRANE CLASS 600 GATES

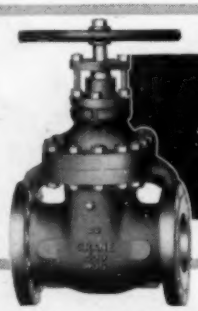
for instance...

Time and the elements make little impression on the efficiency of Crane Class 600 Conduit Pipeline Gate Valves. Grease packed, they'll always operate smoothly and easily—even when it's a long time between turns. In open position, conduit-type ports in the double disc coincide exactly with seat openings, assuring smooth, unobstructed flow with minimum pressure drop. And there's no problem of erosion, either, because the disc is fully seated in open position as well as closed position. Special plasti-packing forms a tight and durable stem seal. Your choice of Full-Way or Venturi pattern valves for working pressures up to 1440 pounds, oil, or gas. Sizes 2 to 30 inch, flanged or welding ends.

CRANE 300-, 400-, 600-POUND WEDGE GATES

Famous throughout the industry for their lasting service. The steel valve with the superior *Exelloy* trim that resists corrosion, erosion and wear. You'll like the smooth operation, the tight seating—the minimum maintenance. Available in a wide range of sizes with flanged or welding ends.

Your choice of All-Iron or Brass Trimmed patterns in this dependable line of Crane Gate Valves. Double-disc design for positive, tight seating and easy opening. Rugged construction throughout. Well suited for general utility in oil, gas or water lines. OS&Y and non-rising stem patterns in a wide range of sizes.



CRANE 200- and 500-POUND DOUBLE-DISC GATES

THE BETTER QUALITY... BIGGER VALUE LINE... IN BRASS, STEEL, IRON

CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

UNIBOLT -

the best way to trap a pig!

Open View.

Just release two bolts and the Unibolt Hinged Scraper Trap swings open like a door. Close it and tighten two bolts. That's how simple and easy it is to operate. There's nothing to drop, no threads to leak, gall, or freeze, no multi-bolt flanges. The Unibolt design places a large area of metal in shear, consequently it is stronger and safer — no danger of failure under line surges or vibration. The oil and gas-resistant gasket is self-sealing under line pressure. Pipeliners everywhere are using Unibolt closures and couplings for scraper traps, blowdowns, strainers, mist removers, and other large diameter pressure vessels. Bulletin PL-510 presents the details on all Unibolt Pipeline Products. A copy will be sent gladly on request.

THORNHILL CRAVER CO.

P. O. BOX 1184 HOUSTON, TEXAS

"I've come to rely on Second National as a clearinghouse of oil and gas information. Their specialized Oil and Gas Department subscribes to oil and gas reports, journals, and records of wells drilled. They maintain the latest statistical files on oil and gas operations, and they have complete sets of field maps, county maps, and other geological information I frequently need.

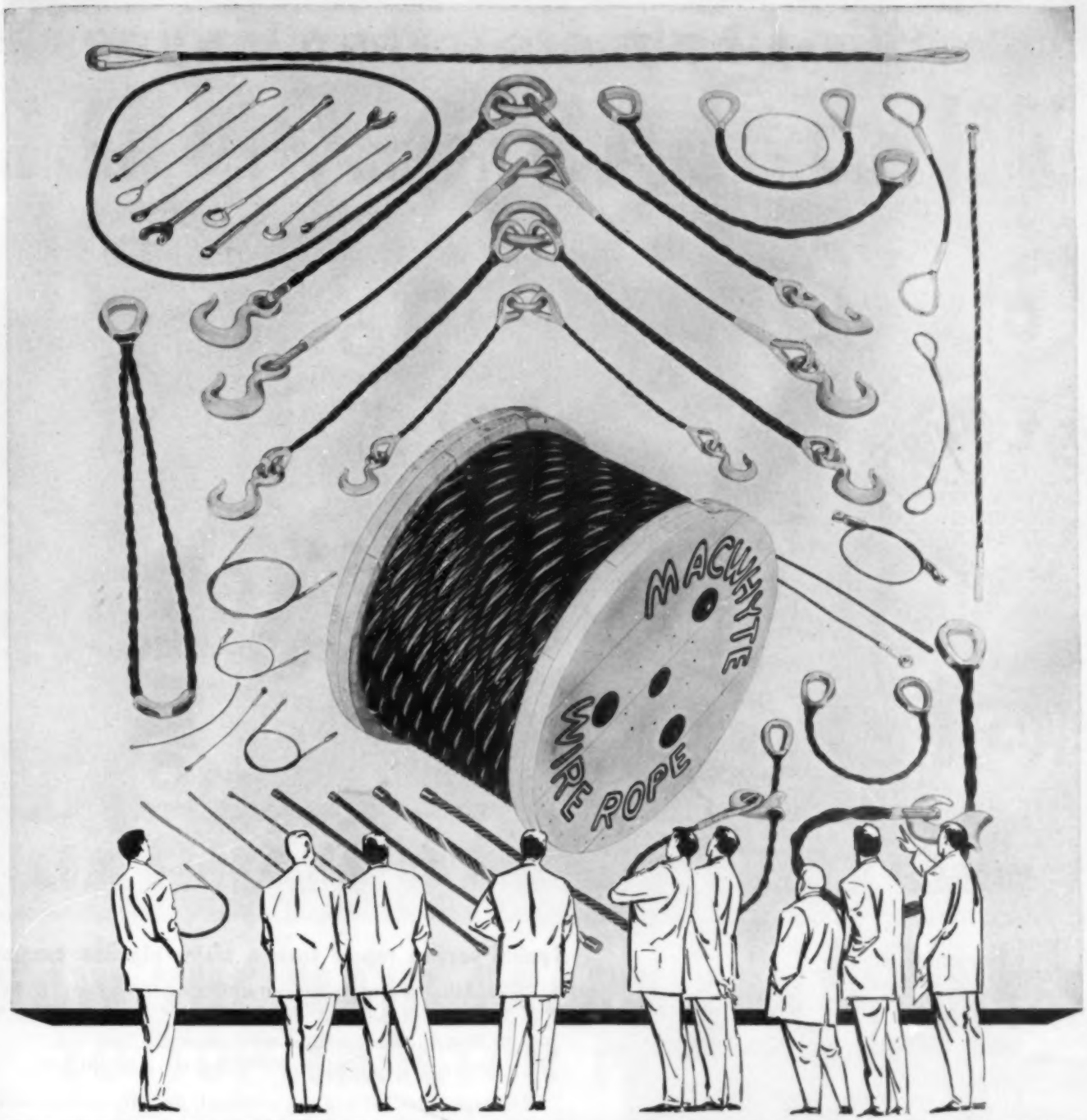
"You'll find Second National's Oil and Gas Department is staffed with graduate petroleum engineers and geologists, men with specialized knowledge, ready to develop statistical information on almost any kind of oil or gas problem."

As an oil or gas man, it will pay you to deal with an *oil minded* bank . . . Second National Bank.

SECOND NATIONAL
Bank of Houston

CAPITAL AND SURPLUS 20 MILLION DOLLARS
MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

47 Years of Service to the Southwest



These ropes, slings, and assemblies provide a big selection for your needs

Shown above are Wire Rope products developed and manufactured by Macwhyte Company for maximum safety and economy. There are a thousand and one types and sizes of Wire Rope in Bright Steel, Galvanized Steel, Stainless Steel, and Monel Metal; hundreds of types and sizes of Braided Wire Rope Slings for materials handling; a wide selection of Wire Rope Assemblies for machine parts and controls; and Aircraft Control Cables, Assemblies, Terminals, and Tie-Rods for aircraft and other uses.

All these products are available from Macwhyte Company and distributors. Recommendations will be gladly furnished. A Macwhyte distributor will be pleased to serve you or write direct to:

Manufacturers of Internally Lubricated PREformed Wire Rope, Braided Wire Rope Slings, Aircraft Cables and Assemblies, Galvanized, Monel Metal, Stainless Steel Wire Rope, and Wire Rope Assemblies. G-16 Wire Rope Catalog available on request.

Mill depots: New York • Pittsburgh Chicago • St. Paul • Fort Worth Portland • Seattle • San Francisco Los Angeles

Distributors throughout the U.S.A.

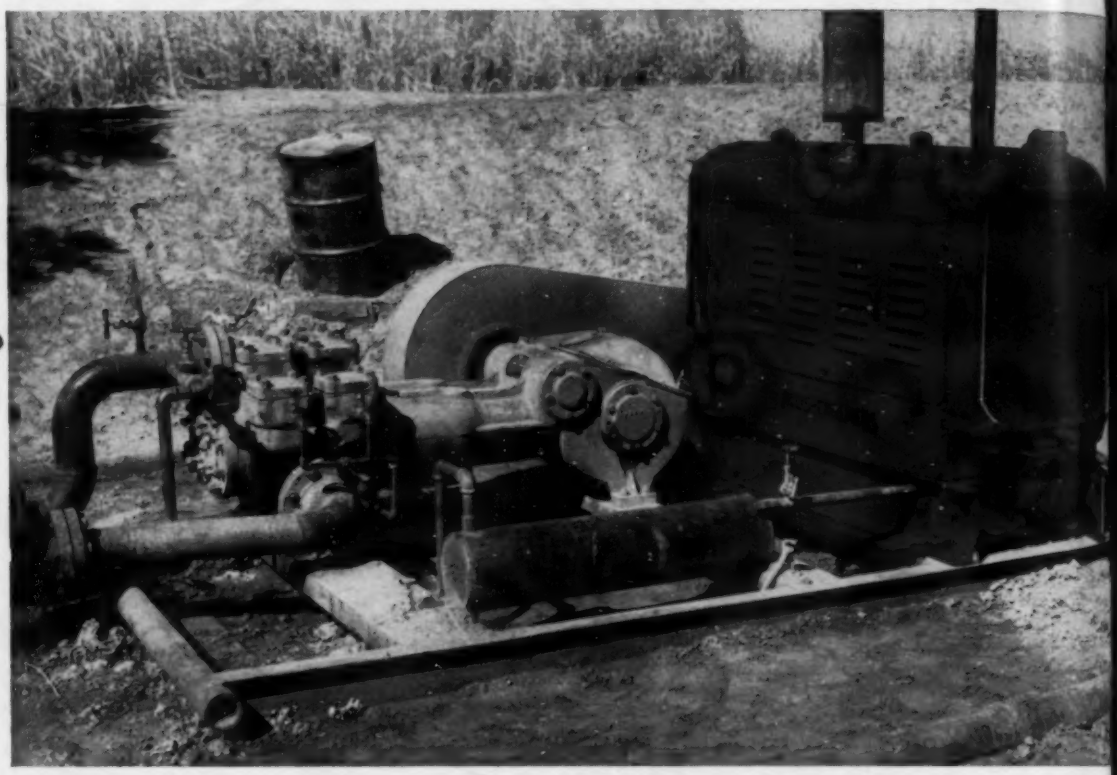
1068

MACWHYTE COMPANY, 2995 Fourteenth Avenue, Kenosha, Wisconsin

Allis-Chalmers OILFIELD Engines

THEY LAST LONGER

FRED E. COOPER INC. TULSA HOUSTON · ODESSA · LOS ANGELES DRAW WORKS SPUDDERS WINCHES POWER UNITS AC



and COST LESS TO MAINTAIN

Typical service report from a major pipeline company

E563 Allis-Chalmers power unit No. 42989
Installed in 1948
Hours of operation to date — 35,200
Barrels of oil pumped, more than 8,800,000

This engine has not had any overhaul, the only repairs having been minor items such as oil filter elements and spark plugs.

Such performance as this is the reason that more and more value conscious users are selecting Allis-Chalmers power.

Allis-Chalmers' modern design features such as removable cylinder sleeves of long wearing alloy iron and valve in head construction, assure you of years of dependable service. Most repairs, when finally required, can be quickly and economically made at the location.

COMPARE

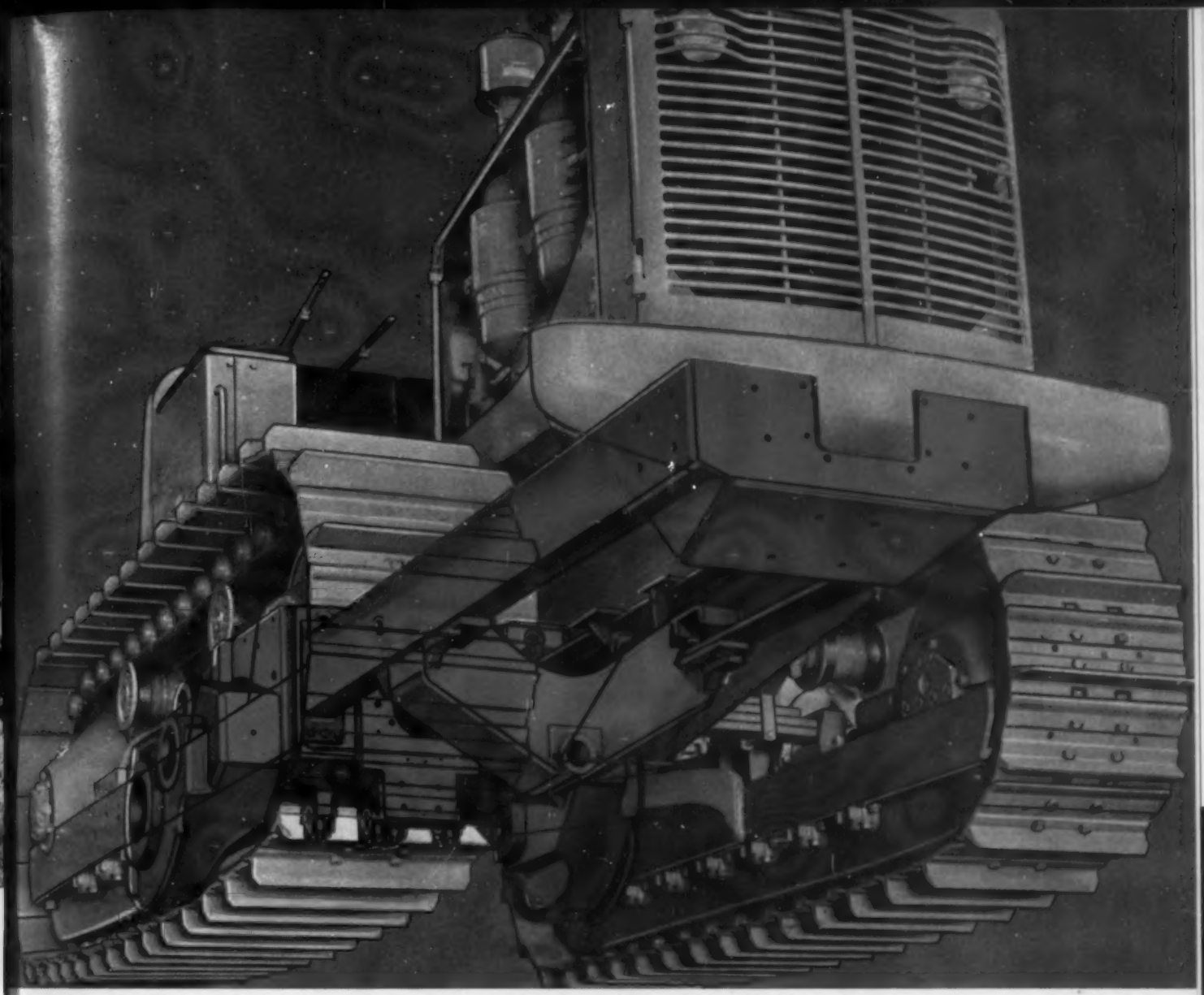
1. Allis-Chalmers Quality
2. Allis-Chalmers First Cost
3. Allis-Chalmers Parts Cost

With those of any other engine.

FRED E. Cooper, Inc.

P. O. BOX 1890 TULSA, OKLA.

Houston · Odessa · Los Angeles · Olney



HOW THE MAIN FRAME CONTRIBUTES TO TOP TRACTOR PERFORMANCE

One of the big reasons why more and more Allis-Chalmers tractors are being used by pipeliners today is their exclusive main frame design.

These frames are one-piece, all-steel welded structural members (like the girders in a bridge or the columns in a building). They help provide greater strength and flexibility to withstand shock loads . . . make possible better equipment mounting, improved weight distribution and outstanding service simplicity.

We invite you to see these advantages . . . first at your nearby Allis-Chalmers dealer and then in a demonstration.

"Rolls with the Punch" — All-steel main frame flexes slightly under extreme shock loads . . . without transmitting the strain to engine, clutch or transmission.

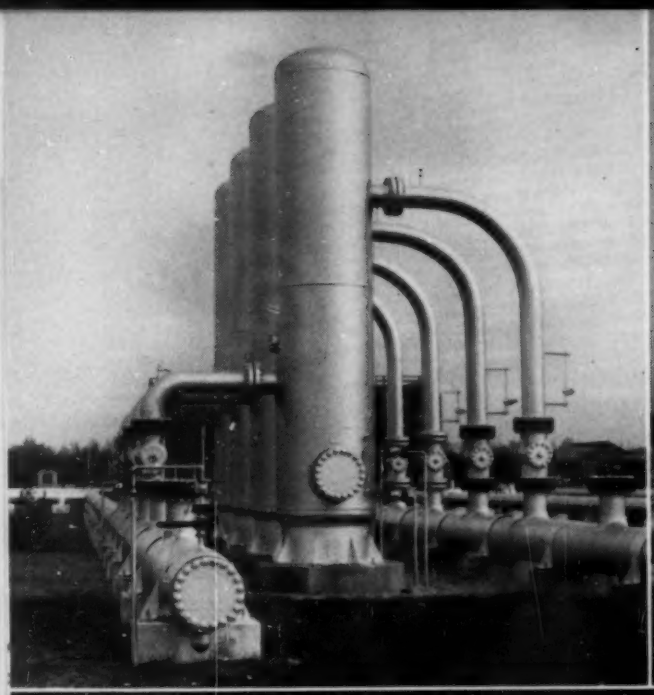
Better Equipment Mounting — This frame's compactness provides ample clearance for equipment like sidebooms and mounted front-end shovels . . . permits wide track shoes . . . improves performance of entire unit.

Improved Weight Distribution — Box A-frame allows location of main components for best over-all balance . . . putting more weight lower in tractor where it does the most good.

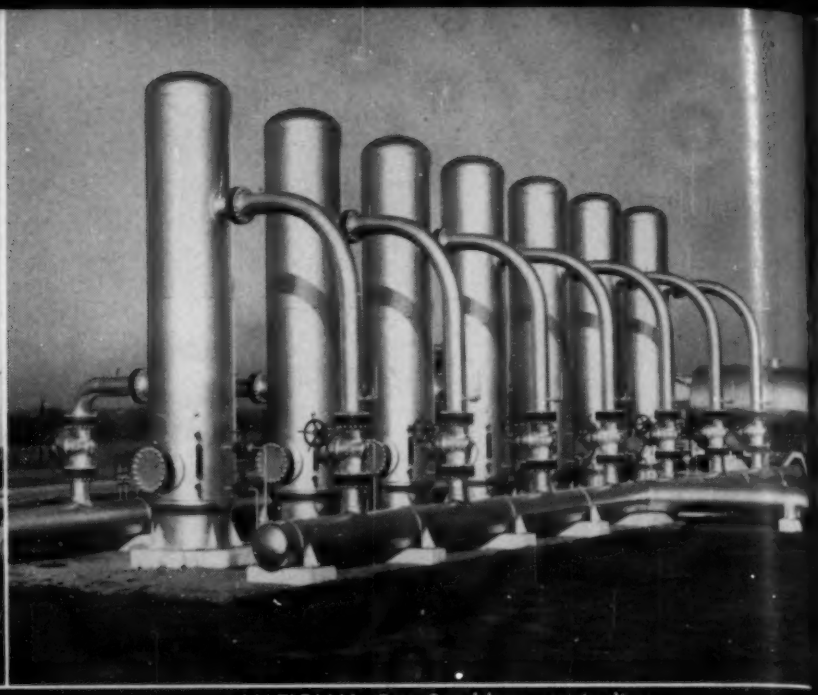
Service Simplicity — Since main frame carries *structural* load, power drive components can be readily removed, repaired or replaced without disturbing adjacent parts.

ALLIS-CHALMERS

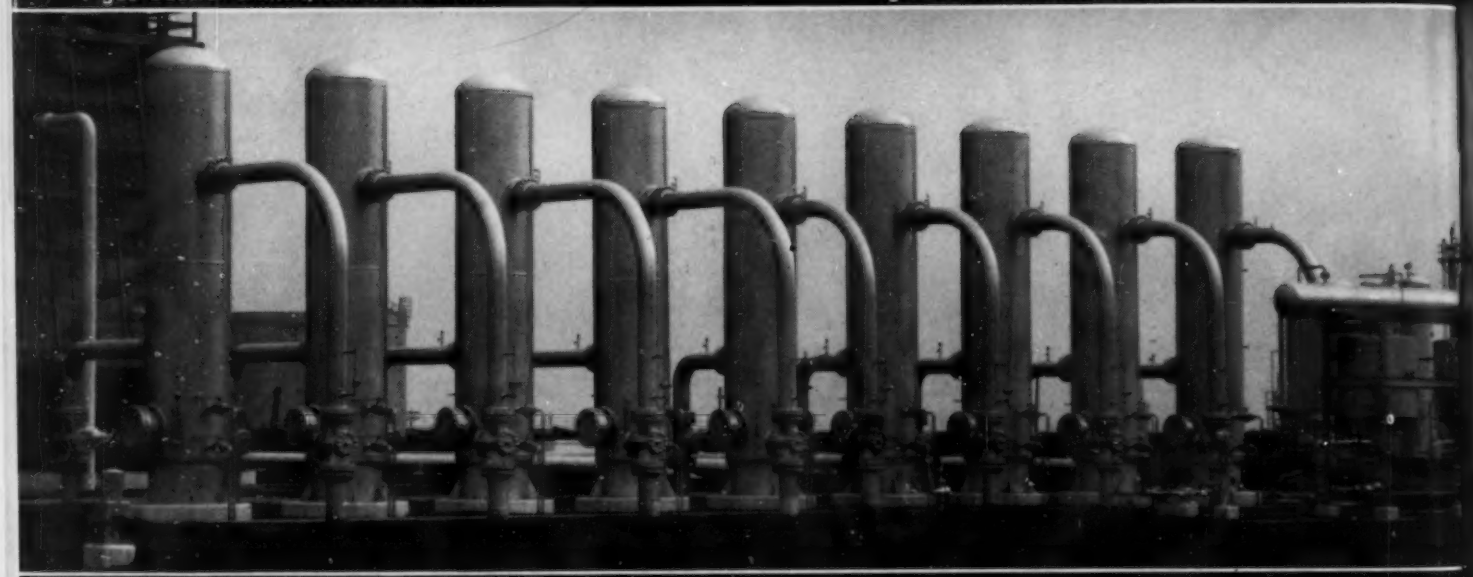
TRACTOR DIVISION · MILWAUKEE 1, U. S. A.



NATIONAL Gas Scrubbers, main line gas booster station, Batesville Miss.



NATIONAL Gas Scrubbers, main line gas booster station, Monroe, La.



NATIONAL Gas Scrubbers, main line gas booster station, Banquitte, Texas

NATIONAL WET-TYPE SCRUBBERS

54" O.D. x 20' — 750 PSI MAX. WP.
90 MM CU. FT./DAY. 12" INLETS AND OUTLETS

The service required of Wet-Type Scrubbers! Pipe line dust and other foreign materials are removed ahead of compressors at each pressure boosting station. This is done best by passing the gas through a special oil bath in a National Wet-Type Scrubber, then removing the liquid particles from the gas stream when passing through the National Gas Scrubbing element in the top part of the Scrubber.

National Vertical and Horizontal Gas Scrubbers are available in a wide range of sizes, working pressures and capacities to fit the needs of gas producers and carriers.

It's a National®

NATIONAL TANK COMPANY

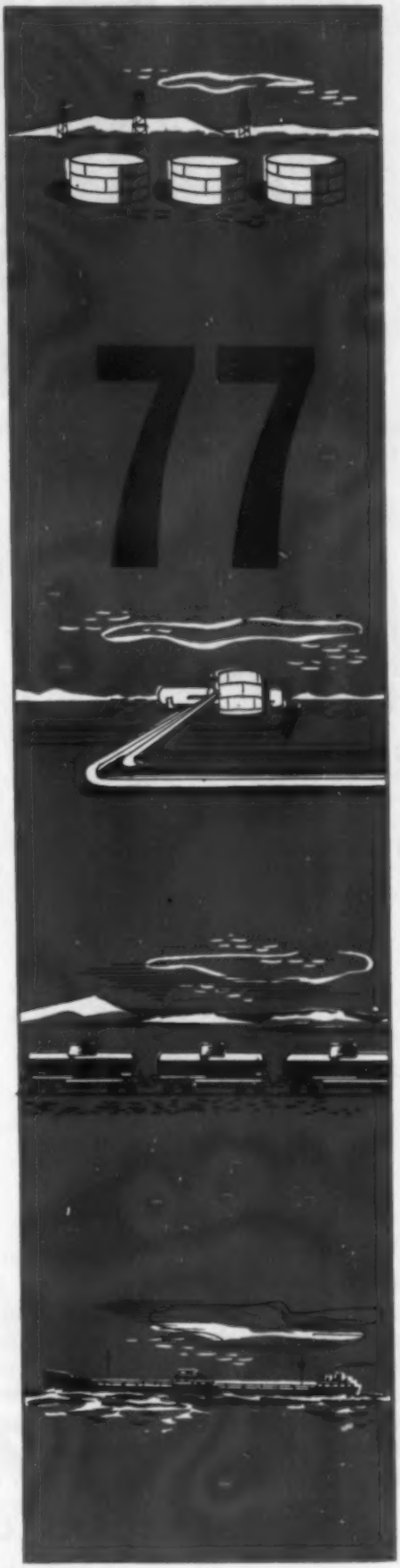
TULSA, OKLAHOMA

2-5-54

PREVENT CORROSION and RUST FORMATION

IN STORAGE TANKS, PRODUCTS PIPE LINES AND TANKERS WITH

KONTOL 77



Kontol 77 prevents corrosion and rust formation in facilities for handling finished products. It is an oil-soluble organic inhibitor, and can be used effectively in the prevention of corrosion in products lines, tankers and storage tanks.

Extensive research and commercial usage have proved Kontol 77 to be an effective preventive of rusting caused by the presence of oxygen in finished petroleum products.

Kontol 77 has no harmful effects on product quality. For example 100/130 octane gasoline treated with 14 p.p.m. shows no change in color, octane number, accelerated gum, precipitated lead or other av-gas specifications.

For complete information, call or write to

TRETOLITE COMPANY

A division of Petrolite Corporation

SAINT LOUIS 19, MISSOURI

LOS ANGELES 22, CALIFORNIA

Chemicals and Services for the Petroleum Industry

K-77-2

For more data on advertised products, use Readers' Service Cards, last page.

9,896 small businessmen help us serve you well

Back in Grandpa's day, horse-drawn tank wagons like this delivered Pearl Oil Kerosene and Eureka Harness Oil to Standard customers. It was a delivery system good enough for the times—but not good enough for a company with a growing demand for its products and a policy of putting them within reach of everyone.

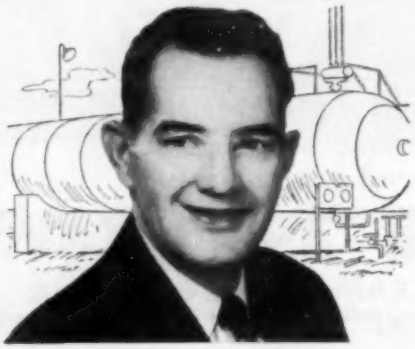
8,329 Independent Chevron Dealers like Jim Davenport, of Phoenix, Arizona, bring Standard's products to motorists.

725 Independent Distributors, like H. G. Hathaway, of Grants Pass, Oregon, distribute our products in rural areas.

188 Independent Marine Dealers like Ted Engstrom, of Olympia, Wash., retail Standard products to Western boatmen.

235 Independent Heating Oil Dealers like F. L. "Doc" Howard, Boise, Idaho, are retailers of Standard Heating Oils.

101 Independent Liquified Gas Dealers like Fred La Frentz, Cedar City, Utah, distribute butane and propane gases.



318 Independent Airport Dealers like Howard S. Fisher, San Diego, Calif., supply Standard products to Western planes.

Ever hear the one about big companies "squeezing out the little fellow"? You'd have a hard time convincing these 6 men—or the 9,890 independent businessmen like them who team with us to bring you Standard Oil Company of California products quickly, conveniently, economically. They form the nucleus of a distribution system that reaches every corner of the West. Each of these men operates his own independent company; together they employ 27,976 people. You probably know some of them because they contribute to the community life and prosperity of thousands of Western towns. Their undertakings are not only based upon Standard products, but operated and expanded with the help of scores of business aids Standard supplies without charge. We do all we can to help them prosper for Standard knows a big company can't succeed without the help of small businessmen. It takes both to serve you well.

STANDARD OIL COMPANY OF CALIFORNIA

75 years of planning ahead to serve you better

Wherever your operations are located in Texas, western Louisiana, or New Mexico, the strategically placed repair shops of Waukesha Sales and Service, Inc., mean that you are close to the best in fast, economical repair facilities. So for service on your Waukesha Engine or Kohler Electric plants and air-cooled engines, take advantage of our personalized attention that keeps your operations running smoothly and reduces your downtime to a minimum.

WAUKESHA

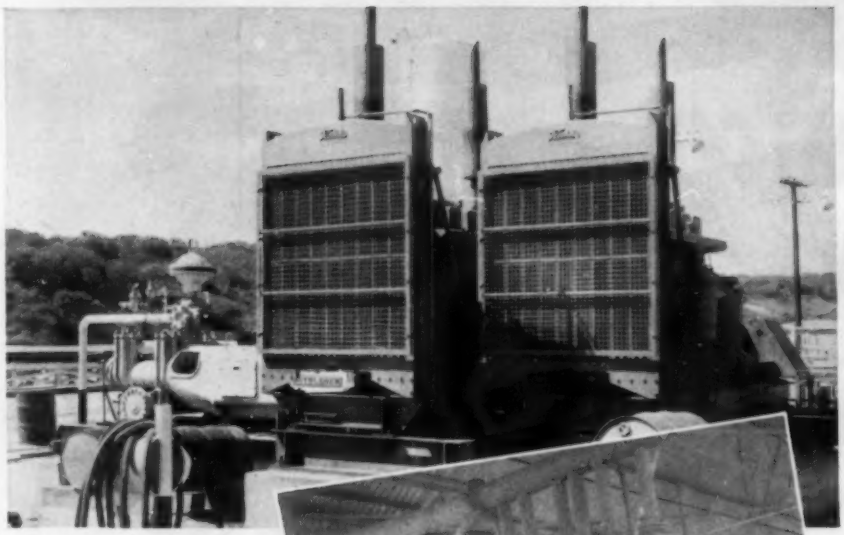
Sales & Service, Inc.

1422 MAURY STREET • HOUSTON, TEXAS

EXCLUSIVE DISTRIBUTORS FOR WAUKESHA PRODUCTS IN TEXAS, LOUISIANA AND NEW MEXICO

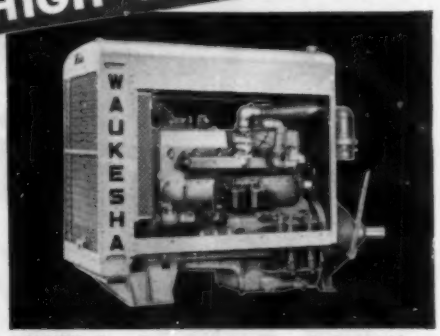
the Profitable Pipeline Power

WAUKESHA



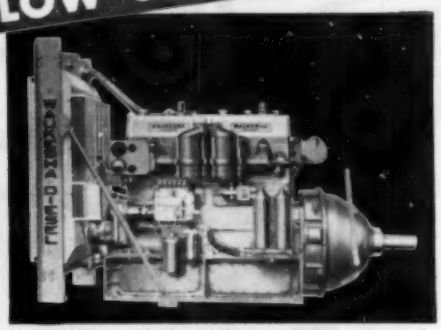
ENGINES and POWER UNITS 10 hp. to 600 hp.

HIGH OUTPUT



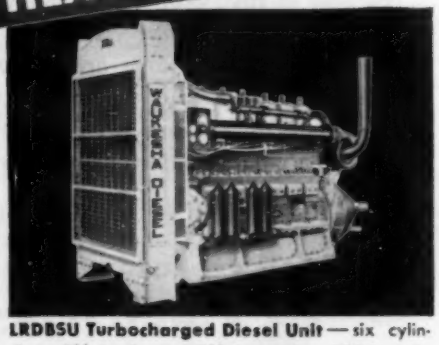
WAKBU Gas Power Unit—six cylinders, 6¼-in. bore x 6½-in. stroke, 1197 cu. in. displacement, 250 hp at 1800 rpm on natural gas.

LOW UPKEEP



NKDBU Normal Diesel Power Unit — six cylinders, 7-in. bore x 8¼-in. stroke, 1905 cu. in. displacement, 274 hp at 1200 rpm, maximum.

HEAVY DUTY



LRDBSU Turbocharged Diesel Unit — six cylinders, 8½-in. bore x 8½-in. stroke, 2894 cu. in. displacement, 526 hp at 1200 rpm, maximum.

Send for

BULLETIN 1079

It gives complete line of Waukesha Oil Field Engines for gas, gasoline, normal Diesel, or turbocharged Diesel operation—to 600 hp.

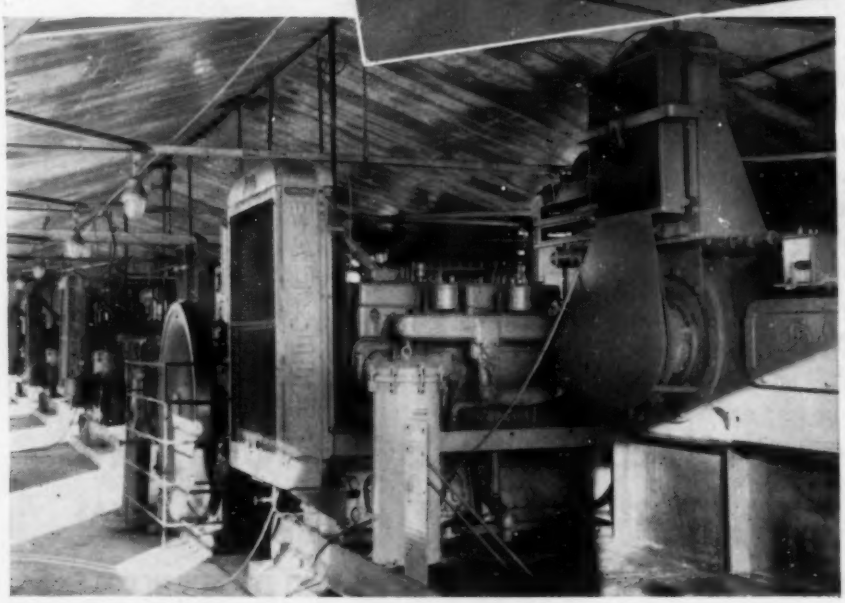
•

WAUKESHA MOTOR COMPANY

WAUKESHA, WISCONSIN

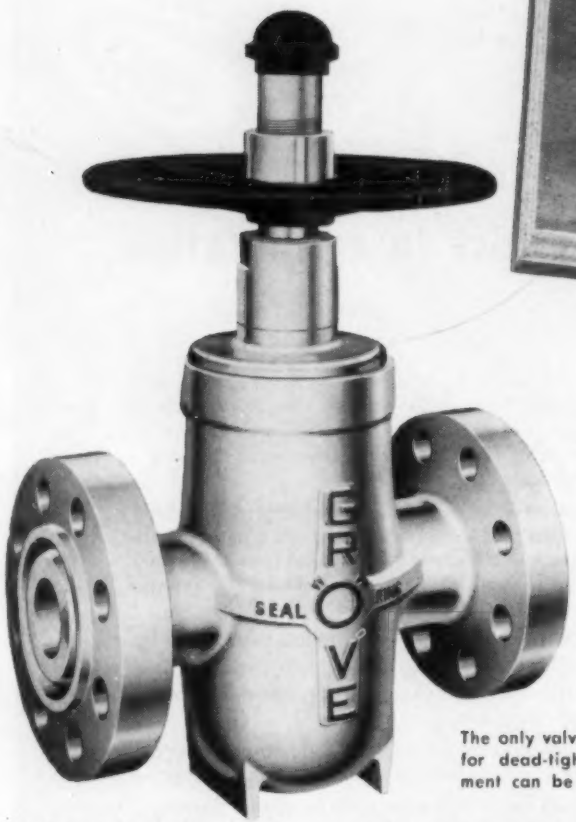
New York • Tulsa

251 Los Angeles



Save 90% of the oil normally lost to evaporation
All it takes is a half-inch layer of Microballoon* spheres of BAKELITE Phenolic Resin floating on the surface of crude oil. This floating cover can save more than 850 barrels a year in an 88-ft. diameter tank! Here are the big features of this new vapor-stopping method:
Easy Application—The spheres—resembling reddish brown flour—are pumped into the tank with the oil. Floating to the surface, they pack into a dense blanket that rises and falls with the oil level. This flexible cover flows around internal supports, keeping the surface sealed as the level changes.
Low Initial Cost—Can be written off in less than a year by oil savings alone.
Protects Profits—Original quality and properties of oil are retained through long storage.
Harmless to Equipment—Small size and non-abrading qualities of the spheres prevent damage to pipe lines and precision pumps.
Long Life—Tests show no deterioration in spheres floating on crude oil for more than two years.
Weatherproof—Used in cone-roofed tanks, this floating layer can't be affected by heavy snow or icing.
Why not get facts and figures on the savings these spheres can bring to your crude oil storage? Write Dept. W-86.
*Trade-mark The Standard Oil Company (Ohio)
BAKELITE
TRADE-MARK
PHENOLIC RESINS
TRADE MARK
BAKELITE COMPANY
A Division of
Union Carbide and Carbon Corporation
UCC
30 East 42nd Street, New York 17, N. Y.

INDUSTRY ACCEPTANCE
forces a change in our name to . . .



The only valve you can check in the line—anytime for dead-tight shutoff. Freedom of gate movement can be checked without breaking the seal.

GROVE VALVE and REGULATOR COMPANY

Special valves have long been important in Grove engineering and production. But, with the unprecedented acceptance of Grove *standard valve* design and performance—*valves* have become a major factor in the company's operation. Recognition of this importance is now carried in the name GROVE *VALVE* AND REGULATOR COMPANY.

Grove Seal-"O"-Ring Gate Valves, which have been responsible for this expansion, offer the ultimate in dependable valve operation for oil and gas production and pipeline services. Unparalleled ease of operation and positive bubble-tight seal are but two of the salient features that account for widespread interest and adoption of this revolutionary through-conduit gate valve.

With nothing so constant as change, Grove's basic objective to provide better equipment for the oil and gas industry has resulted in this change in our company name.

Available through leading oil field supply houses 406

GROVE SEAL-"O"-RING Gate Valves

GROVE VALVE and REGULATOR COMPANY • 65th & Hollis Sts., Oakland 8, California
HOUSTON 4—1901 Calumet St. • **LOS ANGELES 6**—1930 W. Olympic Blvd. • **NEW YORK 17**—415 Lexington Ave.

GROVE SEAL RING GROVE SIMPLICITY ACCURACY SAFETY

CORPUS CHRISTI, TEXAS ODESSA, TEXAS TULSA, OKLAHOMA LAFAYETTE, LA. NEW ORLEANS, LA. DENVER, COLO.

Something New Again
in the LUFKIN LINE – Model TOF (C)

a combination self-loading float and pipe trailer ...

FOR OILFIELD, MACHINERY & HEAVY HAULING TRUCKERS

Get TWO (2) LUFKIN Trailers for little more than the price of ONE (1)

LUFKIN STANDARD MODEL TOF SHOWN WITH ALL OILFIELD SELF-LOADING FEATURES—READY TO BE USED FOR ANY HEAVY DUTY HAULING WHEN FLOAT IS REQUIRED. NOTE—LANDING GEAR FOLDS COMPLETELY UNDER TRAILER AND DOES NOT INTERFERE WITH LOADING OPERATION.

NOSE OF TRAILER IS TILTED FORWARD—BALANCED ON LANDING GEAR—4 PINS ARE REMOVED AND RUNNING GEAR EASILY PULLED BACK BY 1 MAN.

PIPE TRAILER IS COMPLETELY DETACHED FROM FLOAT BED AND READY FOR BOLSTERS, COUPLING POLES, ETC., FOR PIPE HAULING OPERATION.

BOLSTERS AND POLES INSTALLED ON PIPE TRAILER IN A FEW MINUTES.

NOTE: FOUR (4) STEPS ARE REVERSED IN SHORT ORDER TO RE-CONVERT TO FLOAT TRAILER.

HERE ARE THE ADVANTAGES OF THE LUFKIN MODEL TOF (C)

1. **IT'S SAFE—IT'S CONVENIENT**
2. **IT'S CHEAPER—TWO (2) TRAILERS FOR PRACTICALLY THE PRICE OF ONE (1)**
3. **IT'S AVAILABLE—AS A FLOAT OR PIPE HAULER—(2 MEN CAN MAKE CHANGE-OVER IN APPROXIMATELY 30 MINUTES**
4. **ONLY EIGHT (8) TIRES ARE PURCHASED AND MAINTAINED AS AGAINST SIXTEEN (16) WHEN 2 COMPLETE TRAILERS ARE PURCHASED.**
5. **ONLY ONE INSURANCE POLICY IS REQUIRED—IT'S STILL CHEAPER.**
6. **ONLY ONE (1) LICENSE PLATE IS REQUIRED—IT'S STILL CHEAPER.**

You can't GO WRONG with the LUFKIN TOF (C) if you want economy, less maintenance, lower cost and more service.

CALL YOUR NEAREST LUFKIN MAN FOR COMPLETE DETAILS

LUFKIN TRAILERS

DIVISION OF **LUFKIN FOUNDRY & MACHINE CO.**

FACTORY: LUFKIN, TEXAS • Phone 3-4425

BRANCHES AND SALES OFFICES { HOUSTON • DALLAS • ODESSA • SWEETWATER • WACO
CORPUS CHRISTI • SAN ANTONIO • LUBBOCK • SHREVEPORT

Holding SAFETY MEETINGS Regularly

What
POLICYHOLDERS
Say

This is one of many testimonial letters received from policyholders of the Texas Employers Insurance Association. These letters tell what policyholders think of the Service and Savings received from the Association.

Ask the Texas Employers representative nearest you to show you more of these letters, as proof of what Texas' largest writer of Workmen's Compensation Insurance can do for you.

40TH ANNIVERSARY 1914-1954

WE QUOTE FROM A POLICYHOLDER'S LETTER

"We have today received your dividend check for $20,813.23. This check plus our guaranteed cost discount which we have already deducted represents a total savings of 65.69% of our workmen's compensation insurance premiums for the past year.

"Our losses for the year amounted to only 4.31% of our premiums. This is by far the best year we have ever had from the standpoint of the number and cost of accidents sustained. You will recall that we installed a comprehensive safety program at the time you wrote this policy and our employees have diligently maintained this program in effect. Our drilling rigs and our plant are regularly holding safety meetings and we attribute much of our success to these meetings. We feel that the savings in payroll cost and increased efficiency more than offset the time spent on the safety program.

"We heartily recommend a safety program to any contractor in the oil industry."

Largest Writer of WORKMEN'S COMPENSATION INSURANCE *in Texas*

HOMER R. MITCHELL, *Chairman of the Board* A. F. ALLEN, *President*

Service Offices: ABILENE • AMARILLO • AUSTIN • BEAUMONT • CORPUS CHRISTI • DALLAS • EL PASO FORT WORTH • FREEPORT • GALVESTON • HARLINGEN • HOUSTON • LUBBOCK • MIDLAND ODESSA • PORT ARTHUR • SAN ANGELO • SAN ANTONIO • SHERMAN • TYLER • WACO • WICHITA FALLS

TEXAS EMPLOYERS INSURANCE ASSOCIATION
HOME OFFICE - DALLAS, TEXAS

today—it's a bigger catch with MUSCLES OF STEEL

Five billion pounds of fish yearly. It's a catch that would make the oldtime Gloucester fisherman gasp—yet it's all in the day's work for America's modern fishing industry. And it's a job that couldn't be handled without the aid of *muscles of steel*—indispensable wire rope.

Whether off the Newfoundland Banks, along the Gulf Coast, or in the waters of the Pacific, powerful winch-equipped trawlers depend on Wickwire Rope to haul in their heavily laden nets.

On landlubber assignments, too, Wickwire Rope has a vital role in helping American industry do a better and more efficient job. In the oil fields and the logging camps. In the mines and the quarries. On construction and highway projects. In numerous and varied materials handling operations. On all of these jobs, Wickwire Rope consistently demonstrates its ability to deliver performance that is unrivalled for long-lasting economy and reliability.

***every** industry benefits from wire rope*

WICKWIRE ROPE

CF&I PRODUCT OF WICKWIRE SPENCER STEEL DIVISION
THE COLORADO FUEL AND IRON CORPORATION

2534

THE COLORADO FUEL AND IRON CORPORATION—Abilene (Tex.) • Denver • Houston • Odessa (Tex.) • Phoenix • Salt Lake City • Tulsa
PACIFIC COAST DIVISION—Los Angeles • Oakland • Portland • San Francisco • Seattle • Spokane
WICKWIRE SPENCER STEEL DIVISION—Boston • Buffalo • Chattanooga • Chicago • Detroit • Emlenton (Pa.) • New Orleans • New York • Philadelphia

For more data on advertised products, use Readers' Service Cards, last page.

MEASURING UP

EVERY LENGTH of Basalt-Kaiser Steel line pipe measures up to the rigid specifications of the nation's pipe line companies.

This is possible because every step in pipe making, from raw materials mining to finished fabrication, is controlled by us, assuring pipe of highest quality.

During production, Basalt-Kaiser Steel pipe must measure up to 52 rigid tests to make certain it fulfills your requirements for on-the-job workability and durability.

Add to this Kaiser Steel's *prompt service* and *wide range of sizes* and it's clear why pipe men rely on . . .

Kaiser Steel

KAISER STEEL PIPE SPECIFICATIONS • All pipe manufactured to latest A.S.T.M. and A.P.I. specifications

Type	Diameter	Length	Wall Thickness	Shipping Point
Continuous Weld—Threaded and Coupled	½" to 4" nominal I.D.	Uniform 21'	Standard	Fontana, Calif.
Continuous Weld—Plain End	2⅜" to 4½" O.D.	Up to 40'	Standard	Fontana, Calif.
Electric Resistance and Fusion Weld—Plain End	14" to 18" O.D.	Up to 40'	.250" to .500"	Napa, Calif.—Basalt-Kaiser
Electric Resistance Weld—Plain End	5⅝" to 12¾" O.D.	Up to 55'	.188" to .375"	Fontana, Calif.
Electric Fusion Weld—Expanded—Plain End	20" to 30" O.D.	Up to 40'	.250" to .500"	Napa, Calif.—Basalt-Kaiser

Prompt, dependable delivery at competitive prices • KAISER STEEL CORPORATION Los Angeles, Oakland, Seattle, Portland, Denver, Tulsa, New York

PRECISION MADE

Norris Quality Swaged Nipples and Bull Plugs 2" and smaller also furnished in SAE 8620 alloy steel for special refinery and chemical plant service.

W.C. NORRIS, MANUFACTURER, INC.

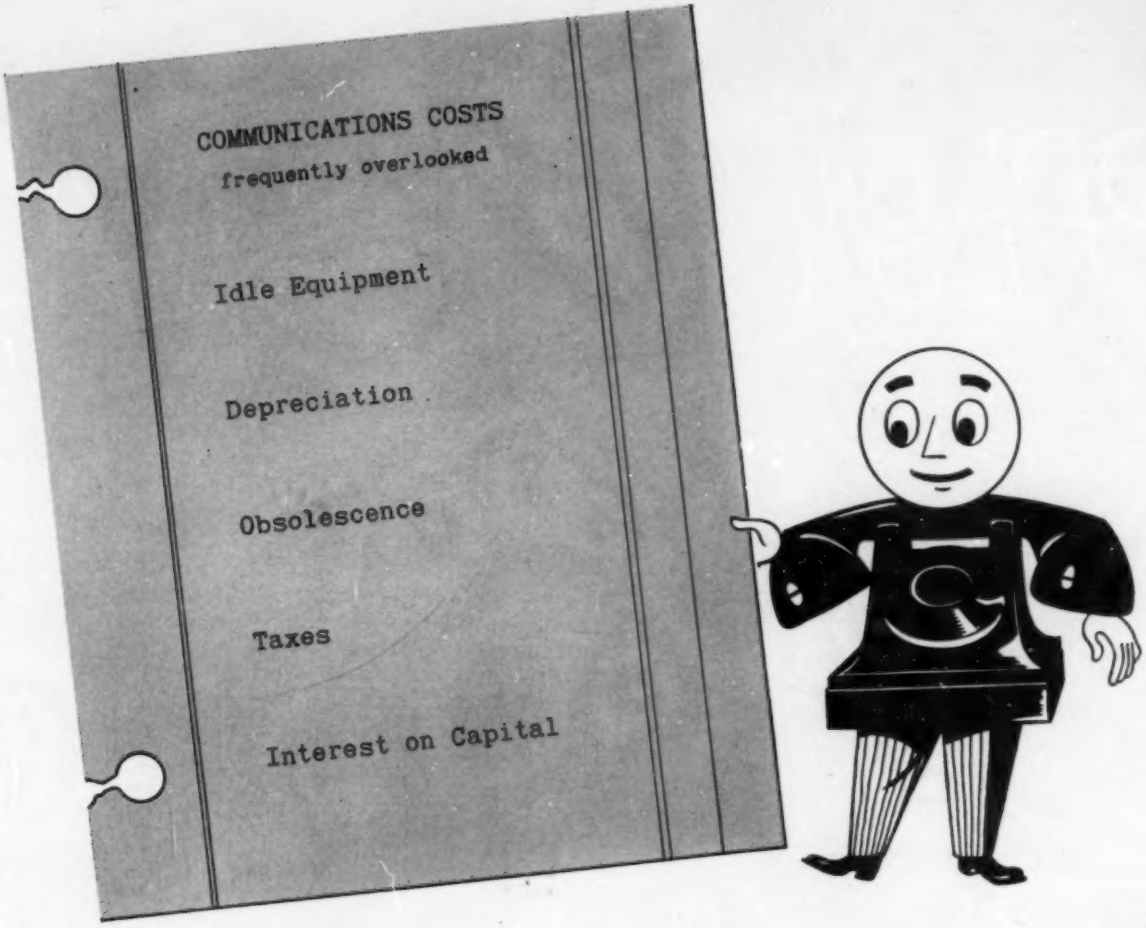
TULSA, OKLAHOMA

WEST COAST DISTRIBUTORS:
REPUBLIC SUPPLY COMPANY OF CALIFORNIA
Los Angeles

Since 1882

BRANCHES:
HOUSTON, KILGORE, ODESSA, TEXAS;
SALEM, ILLINOIS; CASPER, WYOMING

EXPORT: 30 ROCKEFELLER PLAZA, NEW YORK CITY



BELL SYSTEM TAKES THE HIDDEN COSTS OUT OF YOUR COMMUNICATIONS

The first cost isn't the last cost, when you provide your own communications. Many of the continuing costs are buried deep in idle equipment, taxes, depreciation, loss of interest on capital.

Bell System gives just the service you need—at low cost. It's tailored to your operations today, and flexible to meet possible change tomorrow. Your Bell System communications are efficient and dependable, with new equipment and techniques constantly being developed to improve your service.

When you use Bell System communications, you get the benefits of trained personnel, expert supervision, continuing analysis. This high-quality service doesn't tie up capital but leaves your money free for income-producing investments in your business.

• • •

Your Bell Telephone Company will be glad to study your communications problems and needs without charge.

PRIVATE-LINE TELEPHONE

TELETYPEWRITER

MOBILE TELEPHONE

METERING CHANNELS

BELL TELEPHONE SYSTEM

BEAIRD-INGERSOLL-RAND

Packaged Compressor Plant

Lowest Cost Per Horsepower Installed

Triples Production—

PACKAGED COMPRESSOR MAKES FLEXIBLE INSTALLATION

ARKANSAS LOUISIANA GAS COMPANY had seven wells in the Rodessa Field where wellhead pressures had dropped below the pressure of the gathering lines. Formerly good producers, the wells still contained profitable reserves that could be recovered by lowering gathering line pressure. To put the wells back into production economically, a 330 h.p. Beaird-Ingersoll-Rand Packaged Compressor Unit was installed at the Smithland, Texas, gasoline plant. Lowering pressure on the field line and boosting the gas through the plant and into the sales line, the unit tripled production from the wells.

Anticipating a relatively short life for the field, Arkansas Louisiana Gas specified that Beaird design the unit to meet a wide range of operating conditions. The flexibility of this design will permit the unit to be moved without change, to other service. Completely assembled and mounted on its own steel base it required a minimum in the way of permanent foundation and connecting piping. This feature makes the installation almost wholly salvageable when moved.

Pioneers and leaders in the development of packaged compressor plants — Beaird offers you proven equipment with an outstanding record of successful operation over a wide range of service.

Let us show you how a Beaird-Ingersoll-Rand packaged compressor plant can be designed to meet your requirements.

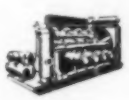
Arkansas-Louisiana-Gas Company's Smithland, Texas, packaged compressor plant — equipped with an Ingersoll-Rand 330 h.p. 6SVG gas engine driven compressor, Young radiator and all necessary equipment and controls. Other sizes 110 h.p. to 660 h.p. The steel deck has been mounted flush with the flooring at the option of the purchaser.

THE J. B. BEAIRD COMPANY, INC.

Shreveport, Louisiana

BEAIRD

MACHINING MANUFACTURING STEEL WAREHOUSE



PACKAGED COMPRESSOR PLANTS

CAST STEEL FITTINGS

PRESSURE BULK STORAGE

ANHYDROUS AMMONIA EQUIPMENT

LP-GAS SYSTEMS

Motorists: here's proof...

Gulf's cleaner-burning, super-refined gasoline solves today's No. 1 engine problem!

This lamp is burning the "DIRTY-BURNING TAIL-END" of gasoline which GULF refines out
This lamp is burning NEW SUPER-REFINED GULF NO-NOX, the cleaner-burning super-fuel

Laboratory tests promised...

. . . these *immediate* and *lasting* benefits from this new, super-refined fuel:

More complete engine protection than from the so-called "miracle-additive" gasolines. Why? Because Gulf refines *out* the "dirty-burning tail-end" of gasoline (the No. 1 troublemaker in high-compression engines)—and then treats this new Super-Refined NO-NOX to give it a *complete range of protective properties*. It protects *every* part it touches against carbon, rust, gum.

Extra gas mileage in all your everyday, short-trip, stop-and-go driving.

No knock, no pre-ignition. Why? Because the anti-knock power of new Gulf NO-NOX has been stepped up to an all-time high.

Stall-proof smoothness. Instant *starts*, too—and fast, fuel-saving warm-up.

That's why new Super-Refined Gulf NO-NOX gives your engine more power-with-protection than you've ever known.

Road tests proved...

These cars, powered by New Gulf No-Nox, actually performed better than new . . . after 15,000 miles!

True! After 15,000 miles per car—covering all conditions of city and country driving—Gulf test cars showed these results:

- Higher-than-new horsepower!
- Better-than-new on gasoline mileage!
- And not a single trace of carbon knock or pre-ignition at any time—even on the steepest mountain grades!

COMPLETELY NEW! SUPER-REFINED

New Gulf No-Nox

THE HIGH-EFFICIENCY GASOLINE

WHO'S MEETING WHERE

OCT.	
4– 6	Petroleum Electric Power Association, Jung Hotel, New Orleans.
7– 8	California Natural Gasoline Association, Ambassador Hotel, Los Angeles.
7– 8	American Institute of Mining and Metallurgical Engineers, Pacific Petroleum chapter, Biltmore Hotel, Los Angeles.
9	Southern Gas Association, natural gas roundtable, Rice Hotel, Houston.
11–13	American Gas Association, Atlantic City, N. J.
12–15	National Association of Corrosion Engineers technical committees, Dallas.
17–20	American Institute of Mining and Metallurgical Engineers, Petroleum Division, Plaza Hotel, San Antonio.
18–19	American Society of Mechanical Engineers-American Society of Lubrication Engineers, Lord Baltimore Hotel, Baltimore.
18–22	National Safety Council, Chicago.
29	Natural Gasoline Association of America, southern regional meeting, Blackstone Hotel, Tyler, Tex.
NOV.	
4	Midwest Industrial Gas Council, La Salle Hotel, Chicago.
4	NEGA Operation Division, Hotel Statler, Hartford, Conn.
5	Southern Gas Association conference on field production of natural gas, Herring Hotel, Amarillo, Texas.
8–11	American Petroleum Institute, Conrad Hilton Hotel, Chicago.
15–17	American Standards Association, Hotel Roosevelt, New York.
17	NEGA Safety Conference, Hotel Statler, Boston.
17–19	Southeastern Gas Association, Sir Walter Hotel, Raleigh, N. C.
17–19	Wisconsin Utilities Association, Electric and Gas Section, Technical and Sales and Service Divisions, Hotel Schroeder, Milwaukee
18–19	National Association of Corrosion Engineers, western region, Hotel Biltmore, Los Angeles.
DEC.	
3	American Society of Mechanical Engineers, Statler Hotel, New York.
3	Natural Gasoline Association of America, Panhandle-Plains regional meeting, Herring Hotel, Amarillo.
7	NEGA Appliance Servicing Conference, Hotel Statler, Boston.

Use the Readers' Service Cards in this Issue

For more information on the advertised products in this issue, make use of the post card just inside the back cover. Circle on the post card the code number of the item desired. Your request will be forwarded to the manufacturer and the material will be mailed directly to you. Use the post card also to obtain material on the new equipment and literature items reviewed in this issue by circling the editorial code numbers at the top of the post card.

Newport Steel

DEPENDABLE SOURCE FOR 4" and 6" PIPE*

Newport Steel concentrates its pipe mill production in 4" and 6" electric weld line pipe. As a basic steel producer for 69 years, Newport makes pipe from electric furnace steel, the superiority of which is well established in the industry. This steel produces excellent thin-wall pipe that cuts your tonnage and cost on any job yet withstands high pressures present in today's lines. Conforms to all API and ASTM requirements, and to this company's own high standards for quality and service. Next time you want 4" and 6" sizes, call Newport Steel.

*SIZES AND WEIGHTS AVAILABLE

O.D.	Wall	Wt. Per Ft.
4½	.125"	5.84
	.142"	6.61
	.156"	7.25
	.188"	8.64
	.219"	10.00
	.237"	10.79
6⅝	.134"	9.29
	.156"	10.78
	.188"	12.89
	.219"	14.97
	.250"	17.02
	.280"	18.97

OTHER PRODUCTS

Hot-Rolled Steel in Coil
Hot-Rolled Pickled Steel in Coil
Electric Weld Line Pipe
Hot-Rolled Sheets
Galvanized Sheets
Galvannealed Sheets
Colorbond Sheets
Hot-Rolled Pickled Sheets
Electrical Sheets
Alloy Sheets and Plates
Roofing and Siding
Eave Trough and Conductor Pipe
Culverts

ECONOMICAL WATERAIL DELIVERY

Newport Steel is situated on the Mississippi-Ohio River system and the great Cincinnati rail hub. With the advantage of location, new river barge facilities and seven major railroads, Newport gives economical, dependable delivery to the entire area of the Middle West, South and Southwest.

Newport Steel CORPORATION

A SUBSIDIARY OF MERRITT-CHAPMAN & SCOTT CORPORATION
YOUR CONFIDENCE IS JUSTIFIED WHERE THIS FLAG FLIES

NEWPORT, KENTUCKY

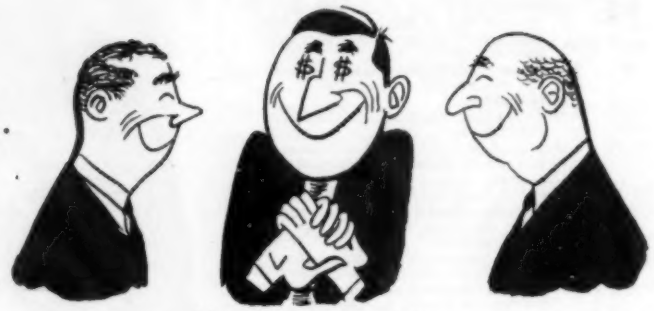
Hate rumor . . .

Bogey rumor . . .

They close banks and start riots . . .

You must learn to stop them . . .

Because . . .



Pipe dream rumor . . .

Rumors Can Ruin You!

By AUREN URIS, Research Institute of America, New York

RIOTS HAVE been started, banks have been forced to close their doors, companies have folded, because somebody whispered a vicious word.

Wherever the winds of rumor blow freely—in plants and offices—they leave a trail of upset and turmoil.

Key word of a rumor may be layoff - bankruptcy - reorganization. Such sparks can lead to conflagration. The fact is, rumors can undermine the foundations of group loyalty and team spirit. Unhindered, they can destroy the team—even the ball field.

The dictionary defines rumor as "a story current but not authenticated—something believed but not proved." But that doesn't give you the true picture, the insight into the nature of the beast. You can usually nail down a lie; but a rumor is like poison gas —in the way it spreads, the difficulty of fighting it, and the harm it can do to the people in your organization.

It's this intangible quality that makes a rumor difficult to handle. The man who thinks it's easy is usually the one who does more harm than good in his efforts to counteract the poison.

Types of Rumors—Generally, rumors fall into three main categories:

. . . the bogey rumors—founded on fear;

. . . the pipe-dream rumor—based on wishful thinking;

. . . the hate rumor—a mixture of fear and malice.

I. The Bogey Rumor. The phone rang in a company president's office. It was his personnel director, obviously upset: "People are quitting all over the place, and I can't figure out why."

An investigation disclosed that a few days before, in a casual conversation, one employe happened to mention to another that he had heard the company was going to lay off 10 percent of its personnel across the board. By the afternoon, the rumor was all over the place, and instead of 10, it was now 50 percent layoff.

No layoffs were planned. But that fact didn't halt the damage.

Behind the bogey rumor you usually find insecurity. It's the man who's uncertain of the future who grabs a crisis out of the air, starts the panic words on their deadly rounds.

You might say, he sees the world through black-colored glasses. He sees in the man who has come to fix a bad floor board, the first of a wrecking crew that's going to rip down the building; a light burning overtime in the front office is taken to mean the company's in trouble.

II. The Pipe Dream Rumor—A week before Christmas, one employe told another everyone would soon be feathering his nest with a bonus amounting to 10 percent of the yearly salary.

Actually, management, as it had in previous years, declared a 2 percent bonus. The let-down—and the resentment—was terrific.

Behind the pipe dream rumor you're apt to find a frustrated individual. He craves adventure, excitement, anything to break up the routine. At the wheel of the family jalopy, he thinks of himself as a jet pilot. He daydreams, mentally acquires all the things he'd like to have—a date with his favorite Hollywood star, a million dollars, the boss's chair.

And all too frequently, it's but a step from an idle thought to an idle tongue.

Let's say someone in the department is going to be promoted. To our pipe dreamer, it's simple logic that, "When they move him up in line, that will mean promotions for all the rest of us." And he starts the juicy item through the grapevine.

III. The Hate Rumor—Mr. X, an employe of six months' tenure, has been trying desparately to make the

grade. But one day he tells his boss, gruffly, that he is quitting—and promptly does.

Later it comes out that the man had been hounded by a persistent rumor that pictured him as a petty thief.

True, a number of small items had been disappearing from the men's locker room, but none of these thefts had ever been connected with the man who had quit. Nevertheless, the rumor had flourished.

Six months later the true story came out when the real thief was caught.

Who had started the original rumor? Clearly someone who, for one reason or another, "had it in" for Mr. X.

The character assassination rumor is the easiest to spread, the hardest to curb. A man's reputation can be ruined overnight. Behind such destructive whispering campaigns you'll usually find a man with a peeve—or worse, a "professional" hater. He devotes an inordinate amount of time to resenting those who are more successful than he is—or merely different.

Troublesome Twosome—Regardless of the type of rumor you're dealing with, it takes at least two people to start the eight-ball rolling.

First comes the rumor starter. He's the one who makes up the rumor out of whole cloth—or, psychologically speaking, out of the mental projections of his insecurity, his day dreaming, or his pet hates.

Next in line comes the rumor repeater. He parrots the tale the rumor starter has built up. Unfortunately, most of us fit into this category.

Generally, there's no malice behind the passer's talk. But that doesn't lessen the harm he can do. Keep these two links of the grapevine chain in mind when you set out to try to counter-act rumors.

How to Fight a Rumor—Fighting a rumor can be a tough, heart-rending battle. In some cases, you can't win. There are some things you can do, some things you can't, and some you shouldn't, when destructive rumors appear on the scene.

Here are some of the steps which can help you, in certain instances, root out rumors. But they are not fool-proof measures. Sometimes they will work, sometimes they won't. Nevertheless, they are worth considering when you're up against a rumor situation:

• Fight it or forget it? When the story comes to your attention, the first thing you have to do is to decide whether or not it's the kind of rumor you have to fight. There are a few simple standards by which you can judge:

. . . Are people taking it seriously? Sometimes a story gets around without anyone taking it very much to heart. It may even be a gag—which will be accepted as humor, as long as tempers don't get short.

. . . Is anyone being hurt? Funny or not, if an individual is under attack, you may have to take action to protect him.

. . . How widespread? Some rumors spread all over the place, others are restricted to a small group. The extent to which a rumor has spread is another factor in helping you judge whether you need to take action.

• What are the facts? Your first step is to learn the actual facts, if possible. The nature of the rumor itself usually tells you where to look. A rumor about John Jones, for example, means that he would be the starting point of your investigation.

• Should you play private eye? It's unwise to try to play detective in handling rumors. A better bet is to call in the key people involved and talk to them either individually or collectively, on a cards-on-the-table basis.

• What's your strongest weapon? Frequently, the simple truth is the best way to give the lie to a rumor.

You can usually stop a rumor cold by—

. . . convincing your people of the falseness of the story;

. . . making them recognize the harmfulness or unfairness of the story.

• Can you straighten out a distortion? Here's a rumor that was brought to one executive's attention:

"We've heard that Mr. X is going to be fired because the company thinks he's too old. That's unfair and we're circulating a petition to protest the move."

Frequently, it's the half truth that causes the most trouble. You may be able to set the record straight:

"Yes, it's true that Mr. X is leaving, but the reason is that he's incurably ill. Don't you agree that under the circumstances it would be best if the whole thing were kept quiet?"

• Can you track down the source? Don't think it's easy. The trail to the den of the rumor starter is lined with pitfalls. More often than not, as you try to follow the trail, you come to a dead end:

"I heard somebody in the lunchroom talking about it, but my back was turned and I didn't recognize his voice."

But try this approach, based on your knowledge of the three types of rumors.

First, label the rumor—bogey, pipe dream or hate variety. Check your last source, and find out his source. Then, since you've labeled the rumor, you have an idea as to the kind of individual who's at the bottom of it.

Even where the trail ends in a cloud of dust, it still may be possible to spot the offender, if you know your people well enough. In the hate rumor, which is essentially the character assassination of one Don Doakes, let us say, you know where to look if you know some of Don's personal enemies.

But—don't be too quick to pin the blame on any individual. In 50 percent of the cases you'll probably be accusing an innocent person. And even if you have the right man, you may have no proof. Your most effective strategy may be to get close to the source, get close to the rumor starter, and then quit. If he can take a hint, you may have permanently ended his rumor-mongering.

Handling the Rumor Starter—When you succeed in tracing a rumor back to its source, your best strategy is generally indirect, long-range. The chief advantage in spotting the rumor monger may lie in preventing a next time.

Where you determine, for example, that your rumor starter is operating from a basic insecurity—via the bogey man type of rumor—you may be able to make the moves that can relieve some of the burden of anxiety that starts his fabrications.

If the culprit turns out to be a pipe dreamer, you may conceivably be able to bring him down to earth, start him on the way to the realistic accomplishment of his goals.

If you find you have traced a "hater" at the end of the line, your problem is a little different and a little tougher.

He's apt to be the one with the most serious emotional difficulty. Chances are you won't be able to change the way he thinks or the way he feels.

Yet a heart-to-heart talk can sometimes do the trick. Don't lecture him—although with some individuals, pointing out the unfairness of their actions, may hit home. If you get no sign of agreement or cooperation, you may have to put it to him squarely:

"We can't stand for that kind of

Continued on Page 42

TESTING CONTROL EQUIPMENT for accuracy is Charles David Martin of Bastrop, La., under the watchful eye of J. C. Simpson, meter technician for Texas Gas. Martin, a mechanical engineering major at Louisiana Tech, is one of 22 college students who were enrolled for the past summer in the Texas Gas on-the-job training program.

Texas Gas is offering . . .

Summer Jobs With a Future

College students hired by Texas Gas Transmission Corporation for vacation work are graded with eye toward permanent positions.

THE THIRD YEAR of a long-range program designed to attract promising young college graduates to jobs in the natural gas industry has just been completed by Texas Gas Transmission Corporation of Owensboro, Ky.

Twenty-two college students were enrolled for the past summer in an on-the-job training program inaugurated in 1952. Purpose of the program is to provide Texas Gas with a source of trained employes for the future and to help the college student decide whether or not he will be interested in the natural gas industry as a career.

Although numerous companies offer summer jobs to college students, Joseph N. Bowers, supervisor of employment for Texas Gas, believes his company's program is unique in that a thorough grading system has been set up to establish a college trainee's qualifications at the end of each summer's training period. A complete evaluation is made on each student in regard to his willingness to work, efficiency, aptitude, and ability to get along with fellow workers. He is graded by job supervisors in charge of training him.

JOSEPH N. BOWERS, supervisor of employment for Texas Gas, is in charge of the company's summer training program for college students.

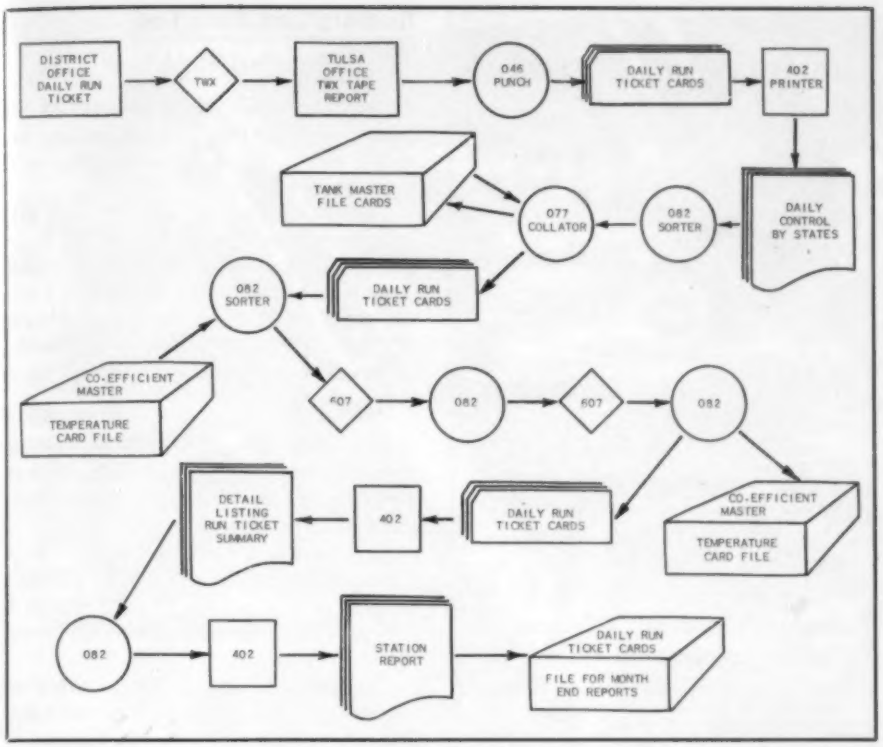
College trainees who show promise are reemployed each summer until graduation. They will be offered permanent positions with Texas Gas after they receive degrees.

Jobs in the summer training program are not created just for the college students. The trainees are assigned to positions where actual vacancies exist. Prior to the dates that colleges suspend classes for the summer, Texas Gas department heads are asked to submit requests for students to be employed in their departments under the program. The salaries paid the students are chargeable to the budgets of the departments in which they work and train.

Early each spring, Bowers sends out letters to the deans or placement bureaus of colleges and universities in the nine-state operating territory of Texas Gas, telling them of the training program and asking that they call it to the attention of their students. Applications are screened closely to determine if the student's educational background and any previous working experience equip him for training in one of the vacancies. Engineering and accounting students are most in demand.

Vacancies were filled this summer by college trainees in the following departments: compressor station, pipe line, measurement, corrosion, general engineering, general services, gas supply, and internal auditing.

The 22 students enrolled for the 1954 program were from the following colleges and universities: University of Kentucky, Purdue, Wabash, Louisiana Tech, Murray State Teachers, University of Dayton, Centenary, University of Illinois, University of Louisville, Missouri School of Mines, and Massachusetts Institute of Technology. —**The End**



FLOW SHEET. Step by step procedure in the rapid, automatic handling of oil run ticket information from the field to Service Pipe Line Company headquarters at Tulsa.

New System Speeds Up Oil Run Ticket Audit

It saves time and money by eliminating manual pre-audit, punching, and verifying.

By C. B. CARSTEN, Head of Tabulating Section, Service Pipe Line Company, Tulsa

A METHOD WHICH automatically transmits oil run ticket information from the field to the head office in Tulsa has partially solved the time lag problem and is speeding audit operations for Service Pipe Line Company. The new system which is being tried out in two of the company's districts eliminates mailing, manual pre-audit, manual punching and verifying, all of which are time-consuming elements.

The run ticket, prepared by the pipe line gauger and witnessed by the producer's representative, is the backbone of oil accounting. The interpretation of the data reported on the run ticket is of the utmost importance. It is a record of the company's responsibility for the delivery of a stated volume; it serves both the purchaser and producer in their purchase and sale arrangement, and it is required by governmental bodies regulating the conservation of the production of crude oil.

Service Pipe Line Company is now connected to about 27,200 wells producing into 15,600 tanks. Gaugers issue 40,000 run tickets per month covering the receipts of oil. By relying on mail service considerable delay and inconvenience has been experienced when the tickets arrived late at the Tulsa headquarters.

A need has been felt for a faster method of communicating run ticket information from the company's widely scattered field locations in order to meet the dead line for governmental reports, and to furnish to purchasers essential information to permit them to make settlement to operators and royalty owners. To expedite the receipt of this information from the field with accuracy and speed, a system of automatic transmission of run ticket data was worked out and is now being tested with most satisfactory results.

In the past, regardless of the speed of the office machines in computing, the time lapse in transmission of information could not be overcome. The gauger upon completion of the run ticket mailed it to the Tulsa office. The mailing time and the time in transit were time consuming, especially those sent from such far places as Casper, Wyo., and Tioga, N. D.

The tickets when received in the Tulsa office were manually audited for the opening and closing tank table barrels and for missing tickets. Any errors discovered on this audit resulted in further delay. After audit, it was necessary to manually key punch the information into IBM cards before the daily detailed listings could be made. The time lapse from point of origin in the fields to the finished report of a day's business would vary from five to eight days.

Working with representatives of Southwestern Bell Telephone Company, a system was developed whereby the data could be transmitted automatically from the field to the Tulsa office. This was effected by use of a combination TWX and private line teletypewriter service. In the initial test of this procedure 100 tickets were received from a field office and transcribed into automatically punched cards within 20 minutes from the start of transmission time.

Information from the run tickets is received on a TWX tape in the

Tulsa office. This tape shows state, gauger's district, ticket number, tank number, farm code, station code, purchaser's code, gross barrels and temperature of opening gauge, gross barrels and temperature of closing gauge, BS&W, gravity, and date for each run. Also shown on the tape are totals of all tickets for each gauger's district. The tape is checked and if need be corrected before transmission. The district office, by dialing a code number, signals the Tulsa operator that the information is ready. When sufficient circuit time is available the Tulsa operator then notifies the field to start its transmission. The information is received and a tape perforated at the speed of ten characters per second. The tape is then used to transcribe the data automatically into IBM cards. The 046 tape-to-card punch reads the tape and punches the cards at the rate of 1200 columns per minute. Based on the 50 columns of information used in the company's run ticket card the time required for each card is 2½ seconds.

After reports are received from all districts a daily run ticket listing using a 402 printer is prepared. The printer is wired up to permit zero balancing for the total cards from each gauger's district. This daily listing serves as a check on the transmission of run ticket information, and at the same time provides control totals for the gross volume of oil gathered in each state.

The cards are then sorted by tank numbers and matched with the master file in the 077 collator to audit the state and gauger's districts, the farm code, station code and purchaser code. The cards are then returned to the 082 sorter where they are sorted by gravity of oil. They are then separated into API gravity groups for temperature adjustments and the co-efficient of expansion master cards of each gravity group is merged with the run ticket cards.

The merged file is next passed through the electronic calculating punch for adjusting oil to 60° F. for opening measurement. Then follows a sort by temperature of second measurement and return to the electronic calculating punch to adjust the second measurement to 60° F. Within the same operation the adjusted closing measurement is subtracted from the adjusted opening measurement to arrive at the gross barrels at 60° F. The BS&W percentages are computed on adjusted gross barrels at 60° F. and subtracted from gross barrels at 60° F. to arrive at the net barrels. This second calculation completes the cards and they are then available for final daily reports.

The cards are sorted by ticket number, gauger's district and state. Then a listing on the 402 printer is made showing all the information on the run ticket card. A second report is made by sorting the cards by station code then tabulated, showing totals for each main line station reception point. The run ticket cards are then stored for month-end reports.

If the run ticket data is received by 10 a.m. the entire procedure can be completed the same day.

This method of automatic transmission is a quick, efficient means of conveying information. Although it is presently being applied to run ticket data only it is possible the method can be used for other types of information such as payroll and field disbursements. —The End

About the Author

C. B. CARSTEN was born at Ozark, Mo. After completing grade school at Springfield, Mo., and high school at Forsythe, Mo., he joined the company that is now Service Pipe Line Company in 1925, working in the Mailing department. He later was promoted to the Accounting department and over a period of years put in approximately four years of study in accounting methods at Tulsa University Downtown College. He was promoted to the Tabulating section in 1935 and has been section supervisor since 1947.

Rumors Can Ruin You

Continued from Page 39

attitude around here. It creates ill feeling and interferes with getting the work done. If this continues, we'll have to take action."

The plain fact is, malice and evil intentions can't be permitted to flourish on the job. Too much is at stake. You won't ever want to act in haste or anger. But don't forget you have at your disposal disciplinary tools, from a stern rebuke right up to a dismissal.

Are You to Blame?—Investigation has repeatedly proved one outstanding fact: "Rumors are a substitute for news."

A rumor is often an answer to a question that springs up in the public's mind. As one study of rumors in a prison camp showed, the less news, the more rumors.

Rumors rule in an atmosphere of misinformation or the lack of information. The best method for nailing a rumor is not to let it happen in the first place, to have your people so well informed that they themselves are able to separate the truth from the lie.

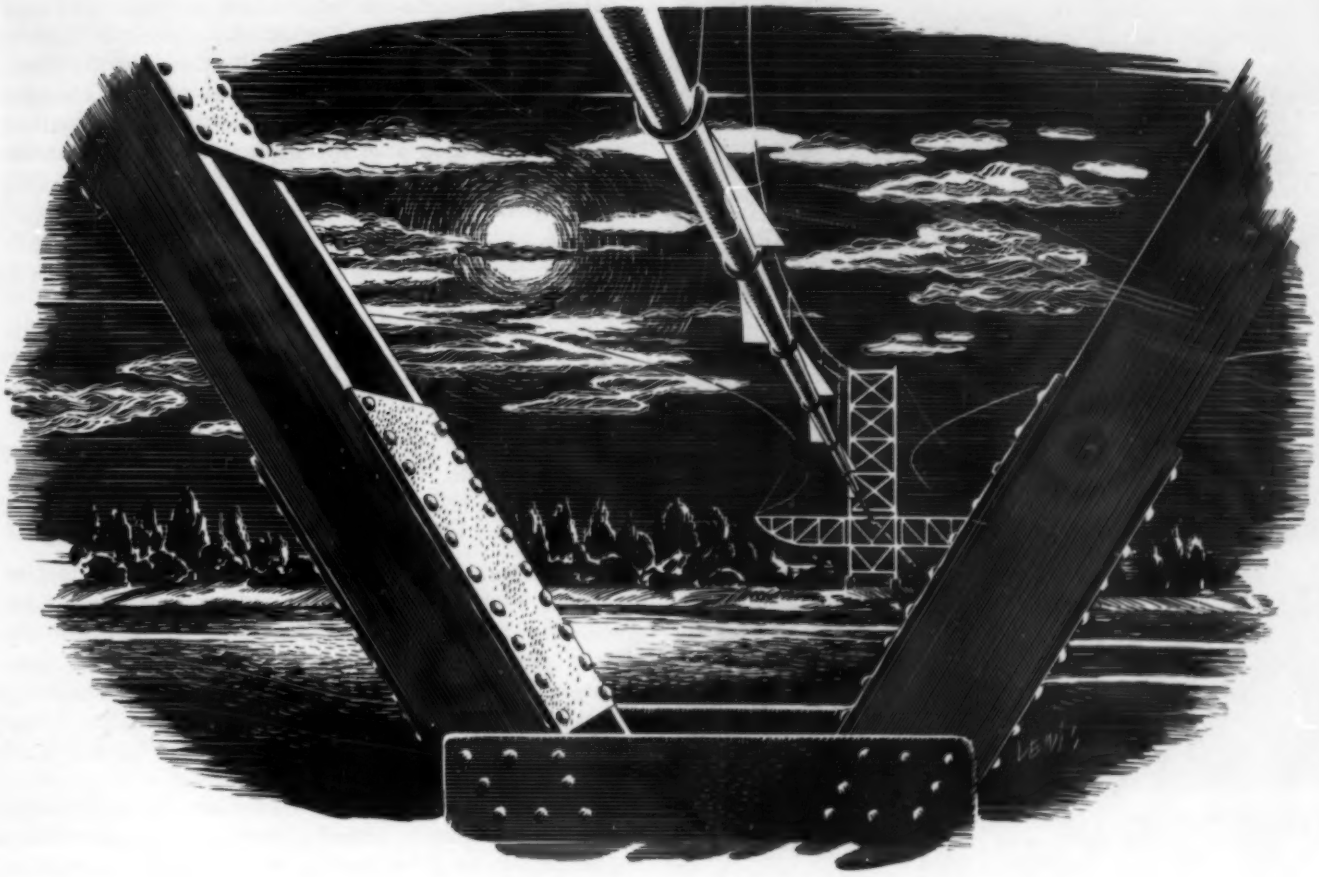
Your Long-Range Policy—To put the chill on the sour grapevine calls for two-way communications—from you to your people, from your group back to you.

Specific communications procedures and contacts like these help make your organization rumor-free:

- Give your people advance notice of any contemplated changes whenever possible. This effort should be carried right down to the department level. Your supervisors, for example, often carry out routine changes. These too should be preceded by an announcement or explanation to departmental personnel.
- Keep your people informed of progress—company sales, finances, expansions, new products, and so on, as much as possible.
- Encourage your people to bring their questions to their superiors. This brings with it a double dividend: any free-floating rumors will reach you or other staff members at the same time it circulates in the group.

Finally, remember that the strongest—or weakest—link in the chain is the individual. The employe who's well informed, who has reason to trust you, and knows he can depend on you for the facts, is practically immune to the deadly germ. He's your strongest bulwark against ruin by rumor.

—The End



the case of . . . The Misbehaving Bridge

What caused the giant, whip-like gyrations in the pipe span over the Colorado River? No one knew. But El Paso Natural had to find out before the Ehrenberg Bridge literally shook itself to pieces.

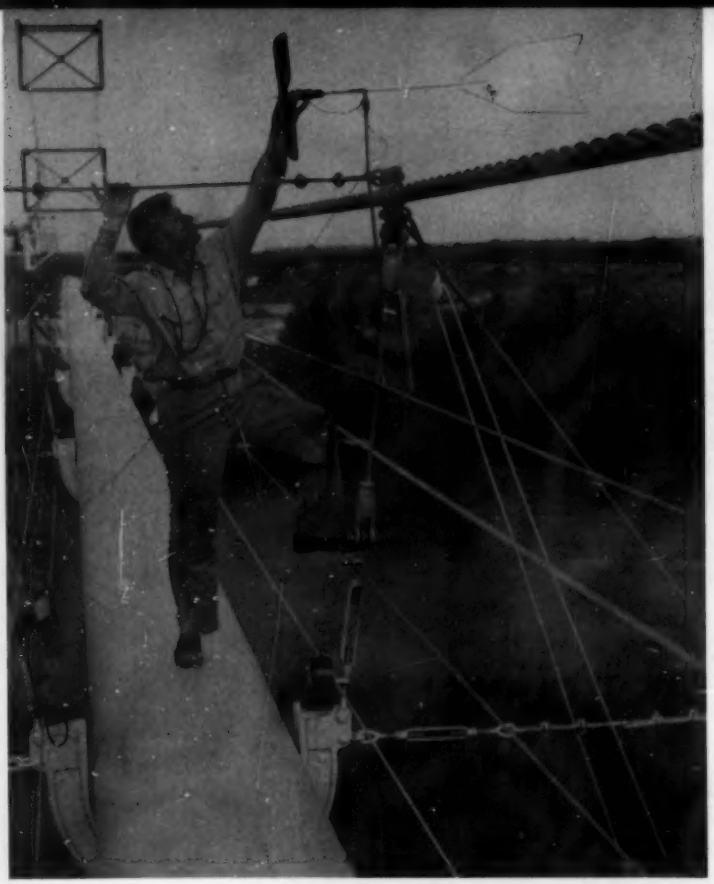
By BILL BRIDGES, El Paso Natural Gas Company, El Paso, Texas

EHRENBERG BRIDGE, across the silt-laden Colorado River at Blythe, Calif., is the western terminus of El Paso Natural Gas Company's southern line. Here, at the exact center of the bridge, directly over mid-stream, the 30-inch line of Southern California Gas Company and Southern Counties Gas Company ties in to El Paso's 30-inch line, and the actual transfer of gas is made.

Ehrenberg bridge is a towering structure. Its cable towers rise 116 feet above the river bank, and it measures 1853 feet from anchor to anchor. Outriggers projecting out from each pylon sweep great arcs of cable across-stream on either side of the pipe to prevent sidesway. Cables dropping vertically, in the conventional Golden Gate style, cradle the pipe on its crossing of the river.

Shortly after the completion of the bridge in 1947, one of El Paso's construction men was fishing in the river from the bank directly beneath the bridge. If any wind at all was blowing, it was the faintest breeze. What made him look up all he can't recall. But suddenly he did. For a second it seemed to him that the 30-inch steel pipe which curved above him across the river was undulating slowly up and down with the flexibility of a rubber hose. He closed his eyes, shook his head, and looked again. It was! And as he watched, the vast, whip-like heaving of the pipe became greater, until it seemed that the pipe would tear itself loose from each bank. The up-and-down motion of the pipe at the center would have measured, he later estimated, three feet.

Within minutes, phones began to ring in executive



RESEARCH CONSULTANT R. C. Baird, called in by Fluor Corporation, checks instruments to determine bridge's high sensitivity to wind.

offices in the company's home office in El Paso.

"This bridge out here is jumping!" were the words which spelled out the strange behavior of Ehrenberg bridge in the first report made to the El Paso office.

After the discovery of the bucking characteristics of the bridge, a close watch was kept on the span. The vibration occurred with almost daily regularity. The extent of the heave of the pipe was measured at as much as 5 and 6 feet. At their peak, the undulations came at about three-second intervals.

El Paso Natural engineers developed several theories as to what was causing the bridge's strange gyrations.

One theory held that the oscillation was caused by the release of energy stored in the main suspension cables, resulting from the heating of the sun's rays.

Another held that the basic cause was the sun's rays, all right, but that they affected the pipe itself, not its cable holders. The sun's heat, this theory maintained, caused the pipe to climb the sides of its suspender cradles during the daytime. With the arrival of the cool part of the day, or a drop in temperature, the pipe descended to its former position in the cradles, and the resulting flexing caused the building up of the vibrations.

It was also suggested that gas surges in the main span might be present because of the 90-degree bends at both ends made in the pipe line approach to the bridge.

Tests were begun to prove or disprove all of these theories and more, including measurements of temperature and of the wind's velocity and direction at the time of the oscillations.

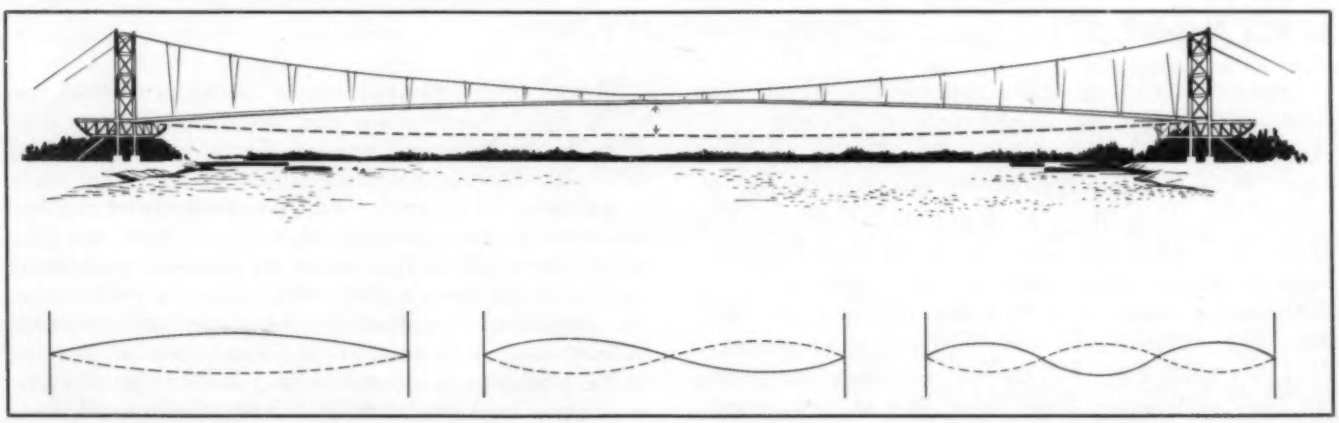
Wind measurements were included to make the series of tests complete. It had been observed that the bridge was quiet during the windy periods, and so wind's effect on the bridge's behavior, or misbehavior, was discounted.

First tests indicated that temperature, the effect of the sun's heat, seemingly had something to do with the gyrations. Temperature recordings made at the bridge site over a period of time showed a distinct drop in temperature at the time the oscillations began to build up force. The drop was of only a few degrees, but it was always of the same amount and it occurred precisely at the time of the oscillation.

The engineer in the home office who studied the temperature graphs could pinpoint the exact time the bridge began its bucking by looking at the temperature dips alone.

At about this time a research engineer from the Fluor Corporation in Los Angeles arrived on the scene in a mobile laboratory, loaded with equipment from his own company and some borrowed from a Hollywood studio. His job was to record scientifically the magnitude and duration of the bridge's oscillations. The engineer was an expert on aerodynamics, and he was not sure about the innocence of the wind in the proceedings.

There was ample proof of the damage which wind could wreak on bridge structures. One of the most dramatic instances, of course, had been the pictorial documentation by a newsreel cameraman of the doom of the Tacoma Narrows highway bridge, in Washington. The bridge, which was a cable-type, like Ehrenberg Bridge, began to oscillate in a high wind, with the oscillations



BUCKLING CHARACTERISTICS of Erenberg Bridge are shown graphically by this sketch. At center of bridge, extent of heave of pipe was measured at as much as five and six feet. Solid and dotted lines at lower left show movement of pipe span during first stages of vibration. In center diagram, gyrations increase as pipe bends in two arcs. Lines at right show motion at peak of vibrations.

becoming greater and more powerful until the bridge literally shook itself to death.

But Tacoma Narrows bridge had suffered its fate in a high wind, and Ehrenberg bridge vibrated in practically no wind at all. In fact, as had been noted, a high breeze seemed to have a dampening effect on the vibrations.

Whatever it was which caused Ehrenberg's lash-like heaves seemingly began as a minute vibration, a raising and lowering of the pipe at first imperceptible to the human eye, gradually increasing in intensity until the pipe was heaving itself up and down in 5 and 6-foot throes.

The Fluor engineers were sure that their instruments would record evidence of whatever was causing the vibrations, wind or not, and so they went about setting up measuring equipment at different points both on and off the span.

El Paso Natural Gas men on the scene helped with the sometimes ticklish business of mounting delicate equipment high above the river on the pipe span.

Wind measuring equipment was installed at three points on the mainspan and floodlighted to make possible night-time observations. At the mid-point, high and low velocity anemometers and a wind vane—the same instruments used by meteorologists and weathermen to record the direction and velocity of the wind—were installed. Metal targets were mounted on the pipe at mid-point and the quarter-points from beneath the pipe. A movie camera with a telephoto lens, borrowed from Hollywood, mounted in the middle of U. S. Highway 60 which crossed the Colorado about a quarter mile upstream, would photograph the oscillations. In this way, using the large targets as guides, the vibrations could be accurately measured.

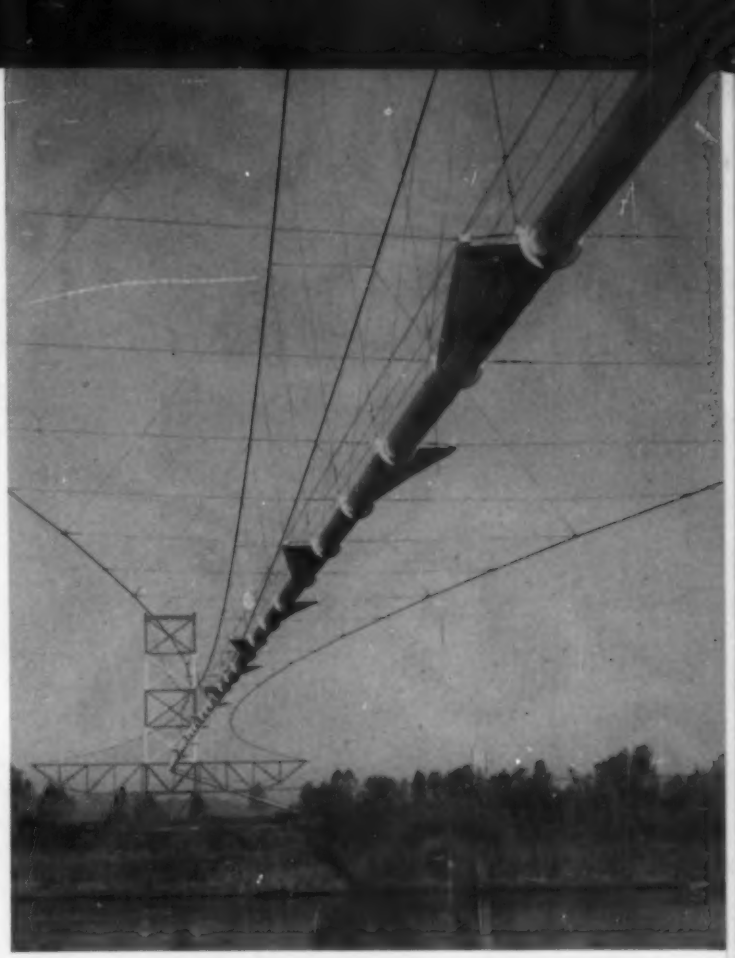
To keep the targets moving vertically up and down when the bridge oscillated and make possible utmost accuracy of measurement, cables were dropped from them to the river bed, to which were attached light anchors. Reading of the dials of the instruments mounted on the pipe at the center of the bridge span was done during the oscillations by telescopes obtained on loan from the Military department of U.C.L.A. Other computations would be made by the Fluor mobile research laboratory, which was located on the scene.

With all this complicated equipment in place and ready to go, the engineers sat back and waited.

Nothing happened. The wait stretched into days, and still nothing happened. The bridge refused to perform for the record. Finally, other pressing business forced the discouraged Fluor engineers to pack their instruments up and return to Los Angeles. They left the targets and their anchoring cables attached to the bridge.

In the days following, it seemed that Ehrenberg bridge had settled down to a calm existence after a tumultuous youth. No vibrations of any strength whatsoever were noted. Inexplicable though this new behavior seemed to be, El Paso Natural engineers were anything but unhappy about the turn of events.

The cables hanging for the targets began to worry El Paso men at the bridge site. They had a tendency to collect debris flowing down river. Also, it was feared that some fisherman in a motor boat might accidentally collide with one of the cables in the early morning or evening hours when visibility was low and the cables very hard to see, and so injure himself or his boat. It was



FINS SOLVED THE PROBLEM resulting from eddies caused by six-mile wind blowing at right angles to the bridge. Stronger winds have no effect on bridge.

decided to remove the cables, since there seemed to be no more use for them. Soon after that, one morning the cables were taken down.

That afternoon, Ehrenberg Bridge began cutting up again, with what seemed to be more ferocity than ever, and the engineers had a real clue to work on.

The Fluor mobile laboratory was called back on the scene to make their observations, and the bridge did not go temperamental this time. With the cables removed, she gave an almost daily performance.

A significant fact about the dampening effect of the large anchoring cables on the bridge was that the wild 6-foot gyrations of such a tremendous structure could be stopped by three relatively tiny and weak cables and anchors only heavy enough to hold some thin metal targets steady. This proved what the experts concerned had long held—that the force which started the oscillations was a tiny one to begin with, which grew steadily more powerful through its own efforts.

While the Fluor engineers were back in Los Angeles interpreting their recordings and making further tests, El Paso men demonstrated this by rowing a small boat to mid-stream directly under the bridge at the start of the oscillations, to where hung the end of a cable which had been attached to the pipe span above. One man, standing in the boat and hauling on the cable, could completely halt the vibrations before they had built themselves up into a sizable force.

The real problem, of course, was to find out the why of the bridge's oscillations, and so correct the fault at its source. While Fluor men worked on this in Los Angeles,

Continued on Page 51

FRAME AT BACK of the tractor gives purchase for the live load line and topping lift for this combination bulldozer and crane.

BOOM CANNOT SWING except with the tractor. The boom is readily demountable for shipment.

Bulldozer Doubles as Crane

An ordinary bulldozer can be turned into a jack-of-all-trades tractor that can bulldoze, tow and double in brass as a crane.

SOMEONE IS CONSTANTLY thinking up a new way to modify equipment—to make it cheaper, faster, or more useful for certain jobs. So it is with this bright newcomer to the pipe line industry. It's a jack-of-all-trades in the tractor line that can tow, bulldoze, and double as a crane. Though it isn't expected to crowd out the side boom, bulldozer, tow cat, or crane, it will likely find many an application on pipe line station construction jobs.

The topping lift and load line on the crane boom can be operated in much the same manner as on the ordinary side boom; and the bulldozer blade has its usual factory-equipped controls. The boom is readily demountable. Shown here it is being used by the Clear Span Bridge and Barge Company to erect an aerial pipe line river crossing in Montana. —**The End**

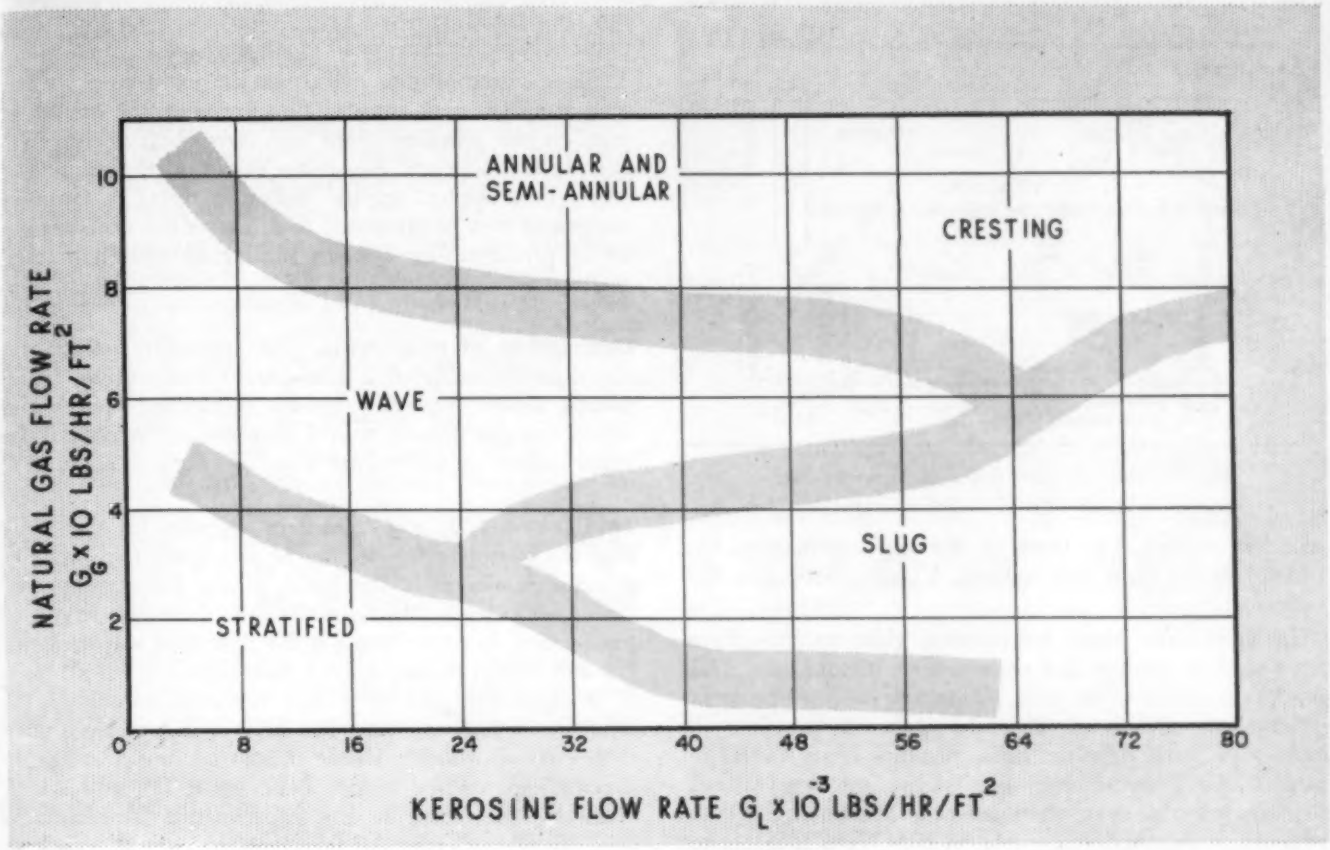


Fig. 1—Flow pattern for kerosine-natural gas mixtures in 1-inch, 1½-inch and 2-inch plastic pipes.

A report on . . .

Horizontal Two-Phase Oil and Gas Flow

By **FREDERICK N. SCHNEIDER,** Stanolind Oil and Gas Company, Tulsa;
PHILIP D. WHITE, Magnolia Research Laboratory, Dallas, and
R. L. HUNTINGTON, Professor, School of Engineering, University of Oklahoma, Norman

DURING THE PAST decade a number of pipe lines have been laid through which oil and gas are flowed simultaneously. In certain areas such as swamps and offshore locations, this method of transportation has been favored. Whether the advantages gained from separate lines offset the additional cost of those lines as compared to a single line carrying both fluids is still a moot question.

Another problem which is encountered in two-phase flow is the feasibility of injecting a liquid drying agent, such as diethylene glycol, into natural gas lines in an effort to reduce hydrate formation. In pipe line design the prediction of the increase in energy loss and liquid holdup are questions which plague the engineer and will remain unanswered until the mechanism of two-phase flow is better understood.

It is essential that lines carrying two phases be of sufficient diameter so that the pressure drops will not be too high and yet their size will be small enough so that the cost will not be excessive. It is well known that the energy losses experienced in two-phase flow are ordinarily higher than those for single-phase flow. This is due not only to the irreversible work done by the gas on the liquid as it is dragged along but also to the reduced flow areas resulting from the presence of two fluids.

No completely satisfactory means has yet been found to calculate the pressure drop resulting under a given set of conditions. Also, the dependence of the various flow types upon flow rates and other physical properties is not well understood. As two phase flow now is being used to a greater extent in industry, the need for additional experimental information has increased. It was with this thought in mind that the present investigation was undertaken.

The progress of experimental work which started about 1939 can be traced through the references at the end of this article. From a review of the early work it

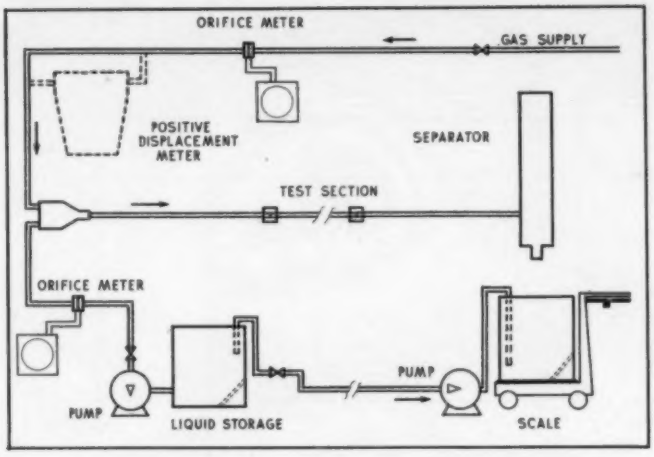


Fig. 2—Flow diagram for the test apparatus.

will be noticed that most of the experimentation has been done on short test sections. Visual observation has been scanty.

In most cases short transparent glass sections have been used in conjunction with various metal pipes. This may have changed the flow pattern at the very point of observation. Other investigators observed the flow in glass pipe with pressure measurements being taken in other lines. Pressure drop predictions are not yet sufficiently accurate even when using the Martinelli method, which is the best development to date. It is illogical to attempt this type of analysis based upon such an arbitrary designation as the fictitious Reynolds number criteria. After visual studies were made, it appeared that there should be some relationship between the visually observed flow types and the pressure drops.

From a practical standpoint the types of flow which are important are **wave flow, slug flow, semi-annular,** and **cresting.** All but slug flow are steady in nature. The pressure fluctuations which result when a slug forms and passes through the pipe may amount to as much as 100 percent, making reliable pressure drop measurements impossible. In a sufficiently long line it might be possible to analyze slug flow, but with the equipment available for this study, it was not. Stratified flow, being limited to low gas rates and moderate liquid rates, was not considered as being very important from the standpoint of pipeline movement of fluids.

These visual studies, which in the main covers **wave, semi-annular,** and **annular flow,** present the results of tests on the pressure drops and flow characteristics occurring in horizontal two-phase flow and the method of correlation applied to the collected data. A tentative composite plot is presented that allows the flow pattern to be predicted for systems similar to kerosine-natural gas.

Description of apparatus. The apparatus used in this investigation included a transparent test section, liquid pumps, temperature and pressure measuring devices, and liquid and gas meters. A flow diagram and photos of the experimental apparatus are shown in Figures 2, 3 and 4.

Test sections. It was considered essential for this study that the complete test section be transparent in order to determine accurately the limits of the various types of flow, and to study them visually over the entire length of test section, in order to see if the flow type was uniform. For this reason plastic tenite tubing was used for all tests. It is rigid and can be joined together smoothly with tetrabromoethane solvent. The 20-foot pipe sections were connected with short plastic collars leaving a relatively smooth joint on the inside. Tubes of 1, 1½ and 2-inch diameter were used in the experiments. Test sections were of varying length, with an average over-all length of 100 feet and an average test section length of 70 feet.

The pressure taps were made by drilling a 1/32-inch hole in the top of the tube wall. Short plastic nipples were drilled, tapped, and cemented over these holes. Attached to the nipples were manometer lines, of clear plastic, with a small gas-liquid separator between the tube and the manometer. The separators were used in order to clear the manometer lines of any accumulated liquid, and the plastic manometer leads allowed any liquid in the line to be noted.

The one-inch line was mounted on adjustable blocks by which the section could be leveled. The tube was leveled within $\pm 1/4$ inch. The conical section was of cast aluminum, machined with a 14-degree inside taper. This gradually converged to one inch where the plastic tube

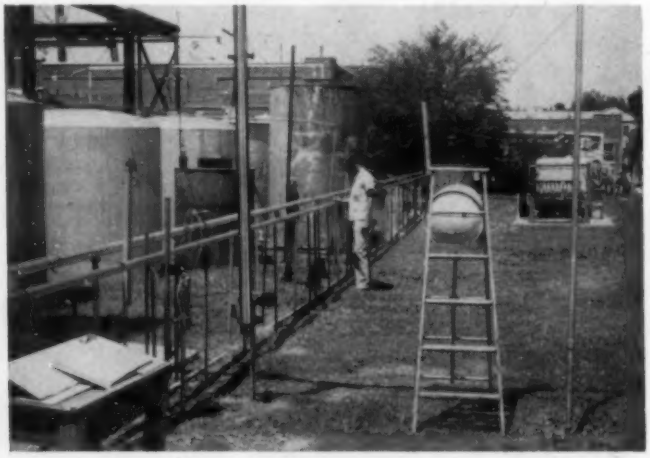


Fig. 3—Two-inch and 1½-inch test sections. Each 100 feet in length.

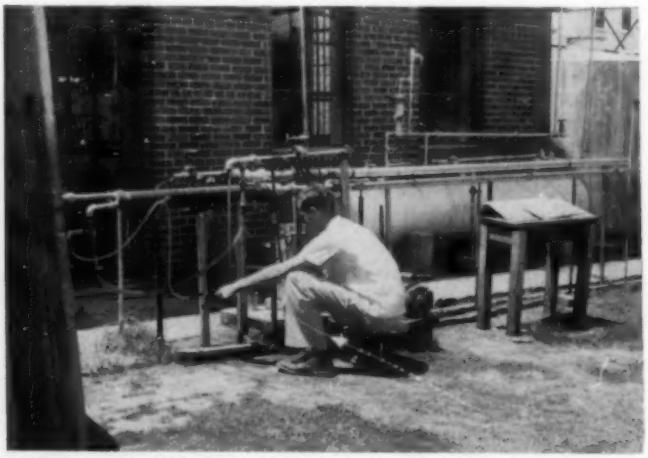


Fig. 4—Test entrance section, metering and pumping equipment.

was joined to it. The gas entered the upper portion while the liquid entered the bottom. This is the type of entrance section used by Gazley[2] in his studies of stratified flow.

Flow pattern and pressure drop data are presented covering a somewhat limited range of flow rates, the pressure drop data being confined largely to the ranges of wave and semi-annular flow.

The relationship between the modified mass velocities, G_g and G_l, giving rise to the various flow types, is shown for kerosine and natural gas in Figure 1. It is not known in what way the other variables affect this relationship. To supplement Figure 1, a summary of visual observations follows.

Jenkins[4] reports that at extremely low gas rates and all liquid rates, the gas flows as bubbles along the top of the pipe. This type was not studied. However, as the gas rate is increased, the bubbles join, producing stratified flow. This type consists of two smooth layers with an undisturbed interface. It can be seen from Figure 1 that stratified flow would tend to disappear at high liquid rates.

At G_l values of less than 24,500 lb/hr-ft,[2] increasing the gas rate disturbs the smooth interface with deep waves being formed. These deep ripples usually characterize the start of slug flow, but below the G_l value mentioned above, they are not of such a nature as to develop into slugs. As the gas rate is further increased, the deep ripples initially present, change into sharp waves with the general liquid level in the tube dropping. The liquid, however, begins to assume the shape of a crescent in the bottom portion of the tube. At sufficiently high gas rates a moving film of liquid forms on the upper surface of the tube.

This initiation of a moving film of liquid is defined for the purpose of this study as semi-annular flow. From the foregoing description, it can be seen that the transition between wave and semi-annular flow is actually a gradual one, and it would not be expected to produce a sharp or definite increase in pressure drop. This is borne out in Figures 5, 6 and 7. With further increases in gas rate, more of the liquid flows along the top surface of the tube. It could be expected that true annular flow would result at sufficiently high gas velocities.

At medium liquid rates and low gas rates, the situation is the same regarding stratified flow. As the transition point is reached, deep ripples form as before. With a very slight increase in gas rate, these ripples change into slugs which close the tube, accelerate, and pass rapidly through the pipe. These slugs may be composed of considerable liquid and froth. In length they vary from several inches to several feet depending upon the conditions of flow. The slugs eventually no longer form with higher gas rates, the pattern becoming wave flow. With further increases the pattern becomes semi-annular and then annular.

At high liquid rates the presence of stratified flow is doubtful, although measurements were not made of the gas rate in this region. Jenkins[4] is in agreement with this observation. Wave flow does not exist, since at high liquid rates a moving film is present at all gas velocities above the slugging region. With increases in gas rate these slugs change from long, slow bodies of liquid to short, fast ones with feathery crests. The designation of

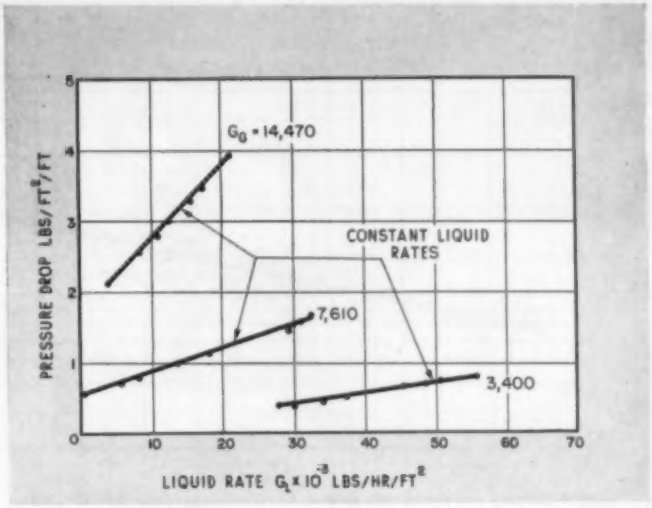


Fig. 5—Observed pressure drops in 1-inch line vs. liquid rate with constant gas rates for kerosine-natural gas.

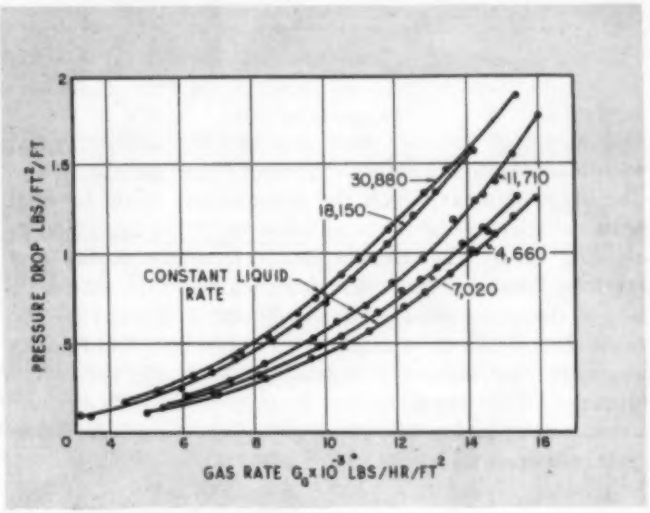


Fig. 6—Observed pressure drops in 2-inch line vs. gas rate with constant liquid rates for kerosine-natural gas.

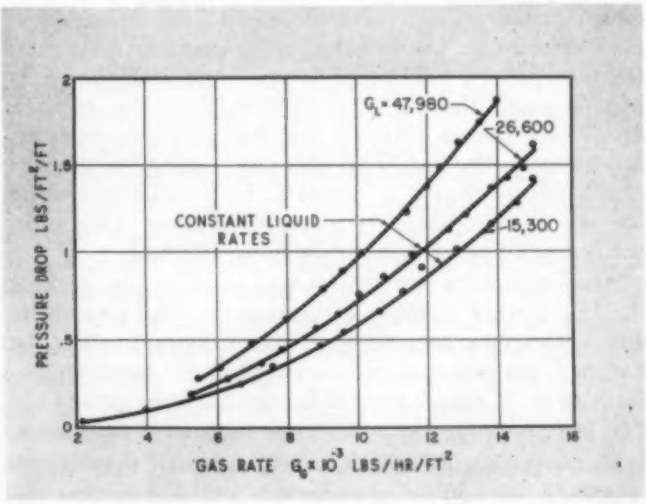


Fig. 7—Observed pressure drops in 2-inch line vs. gas rate with constant liquid rates for water-natural gas.

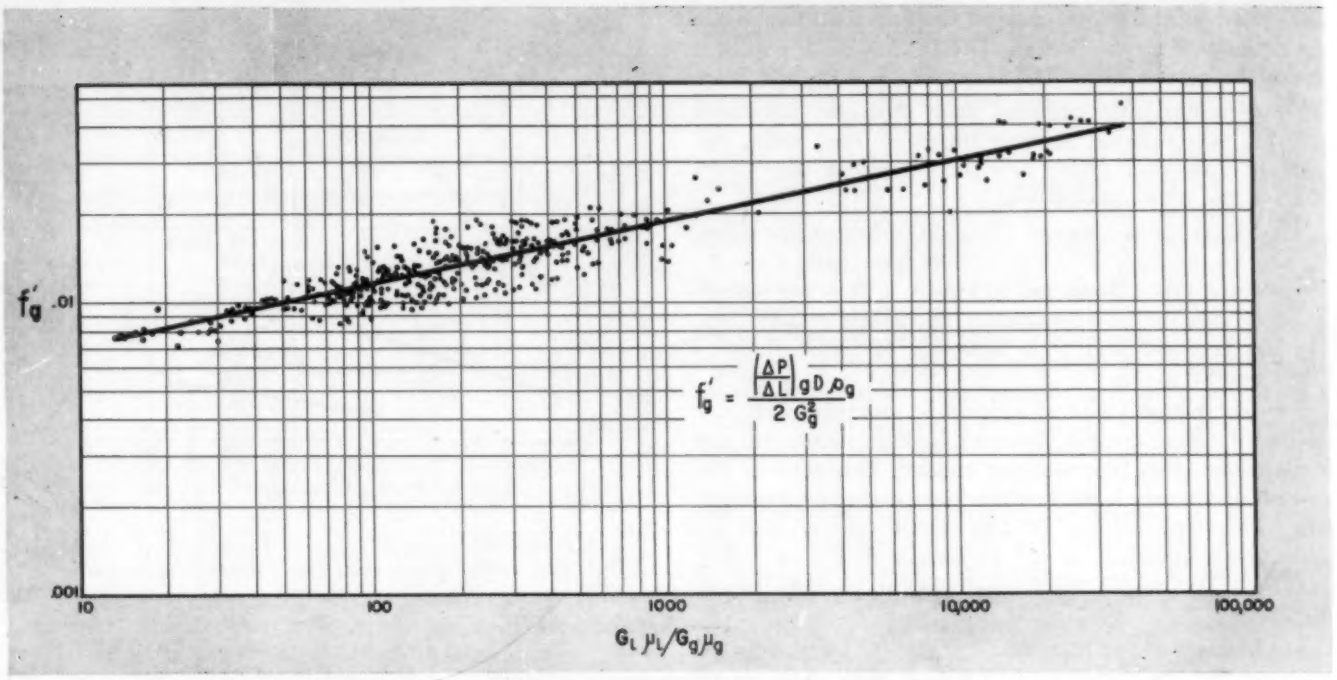


FIGURE 8

slug flow and cresting flow is somewhat arbitrary and was selected on the basis of pressure fluctuations in the line. The point at which the manometers could be read with sufficient accuracy was taken to be the initiation of cresting flow. The change between semi-annular and cresting flow was even less definite. For this reason no line of demarcation was used in Figure 1. Except for the transitions between stratified and wave flow, boundaries are somewhat arbitrary depending upon the individual observer. The whole system is subject to such outside influences as pump vibration, pipe joints, and deviation from a horizontal level.

A series of runs were photographed in color on 16 mm motion picture film. This film of approximately 500 feet is filed with the Department of Chemical Engineering, University of Oklahoma, Norman, Okla. The moving pictures were taken at ten inches from the pipe.

The relationship in the one-inch line between the observed pressure drop per unit length and the modified mass velocity for the kerosine, using constant mass rates for the gas as a parameter, is presented in Figure 5. It will be noted that at $G_g = 3400$ lb/hr-ft^2 the pressure drops were recorded during slug flow at a time when no slugs were in the line. That this procedure gives the correct pressure drop is a question. In a sufficiently long line where there would be a number of slugs in the tube, the measured pressure might be quite different.

After this one series of runs was made, it was decided that no further pressure measurements would be made during slug flow because of the uncertainty involved. In Figure 6, the observed pressure drop in the two-inch line for a series of runs is plotted against the mass rate of the gas, using constant kerosine mass rates as a parameter.

In comparing Figures 5 and 6, although they represent data taken in different lines, it can be seen that the pressure drop is more a function of the gas mass rate than of the liquid mass rate. This is probably due to the higher velocity and lower viscosity possessed by the gas. In Figure 7 the observed pressure drop in the two-inch line for a series of runs is plotted against the gas mass rate using constant water mass rates as a parameter. A similar relationship is noted as is shown in Figure 6.

The best correlation of the pressure-drop data was obtained by plotting f'_g against the dimensionless flow flow ratio, $\frac{G_l\,\mu_l}{G_g\,\mu_g}$, as shown in Figure 8. The value, f'_g, a fictious friction factor, was calculated using the Fanning equation and it is based on the gas flow and the measured two-phase pressure drop. The SAE 40 oil due to its high viscosity gave values of the flow ratio above 3000, while the mass of the data fell between 50 and 1000. The chart values were calculated in the following manner.

Sample Calculation

For Run 43 Kerosine-Natural Gas in two-inch line:

Gas Gravity = 0.71 (air, 1.0)
D = .177 ft
G_g = 9213 lb/hr-ft^2
G_l = 33,640 lb/hr-ft^2
μ_g at 65°F. = 0.0271 lb/ft-hr
μ_e at 65°F. = 3.63 lb/ft-hr
dP/dL = 0.685 lb/ft^2-ft

$$\rho_g = \frac{P_g\,M}{R\,(460 + T_g)} = \frac{29.35\ (.491)\ 29\ (.71)}{10.72\ (460 + 65)} = 0.0528 \text{ lb/ft}^3$$

$$f'_g = \frac{(3600)^2\ (dP/dL)\ g\ D\ \rho_g}{2\ G^2_g}$$

$$= \frac{(3600)^2\ (.685\ 32.2)\ (.177)\ .0528}{2\ (9213)^2} = 0.0157$$

$$\text{Flow Ratio} = G_l\,\mu_l/G_g\,\mu_g = \frac{33{,}640\ (3.62)}{9213\ (.0271)} = 489$$

Conclusions. In summarizing the results of this investigation, the following conclusions and recommendations may be made:

A tentative flow pattern chart is presented for a kerosine-natural gas system. For such combination of fluids this chart makes it possible to predict the type of flow for a given set of mass rates. The limits of the various types of flow are somewhat indefinite for the following transitions: wave-semi-annular, slug, cresting, and semi-annular cresting. Until more data are available, it will not be possible to predict the effect variables such as viscosity, surface tension, and density might have upon the flow patterns.

A correlation is presented which allows the two-phase pressure drop to be predicted if the flow rates, physical properties, and pipe diameter are known. This correlation is limited to those steady-state flows which exhibit uniform patterns throughout the tube length thus excluding slug and stratified flow. It is also limited to systems where evaporation and kinetic energy changes are small. Where these factors are significant, a step-wise solution would be necessary. Whether this correlation obtained in low pressure systems would be valid for high pressure work is not known. It is not known to what extent pipe roughness might affect the two-phase pressure drop. Additional data obtained with the commercial grades of tubing would be helpful.

NOMENCLATURE

T_g— temperature of the flowing gas, °F
G_g— mass velocity of the gas based on full pipe diameter, lb/hr-ft²
G_l— mass velocity of the liquid based on full pipe diameter, lb/hr-ft²
μ_g— absolute viscosity of gas, lb/ft-hr
μ_l— absolute viscosity of liquid, lb/ft-hr
ρ_g— specific weight of gas, lb/ft³
dP/dL— static pressure drop per unit length in two-phase flow, lb/ft²-ft
f'_g— pseudo friction factor based on gas flow, dimensionless
g_c— gravitational constant, ft/sec²
D— pipe diameter, ft
P_g— average absolute pressure of flowing gas, lb/in²
M— molecular weight of gas
R— universal gas constant, 10.72
Re— Reynolds number, dimensionless

REFERENCES

[1] Boelter, L. M. K., and Kepner, R. H.: "Pressure Drop Accompanying Two-Component Flow Through Pipes," *Ind. Eng. Chem.*, (1939) 21, 426-434.
[2] Gazley, Carl, Jr., and Bergelin, O. P.: "A Preliminary Investigation of Two-Phase Flow," University of Delaware Report TPF-1 (May, 1947).
[3] Gazley, Carl, Jr., and Bergelin, O. P.: Discussion of "Generalized Correlation for Two-Phase, Two-Component Flow" by Lockhart, R. W., and Martinelli, R. C., *Chem. Eng. Prog.*, (1939) 45, 39.
[4] Jenkins, Rodman: "Two-Phase, Two-Component Flow of Water and Air," M. Ch. E. Thesis, University of Delaware (1948).
[5] Lockhart, R. W., and Martinelli, R. C.: "Generalized Correlation for Two-Phase, Two-Component Flow," *Chem. Eng. Prog.*, (1949) 45, 39.
[6] Martinelli, R. C., Boelter, L. M. K., Taylor, T. H. M., Thomsen, E. G., and Morrin, E. H., "Isothermal Pressure Drop for Two-Phase, Two-Component Flow in a Horizontal Pipe." *Trans. ASME*, (1944) 66, 139-151.
[7] Martinelli, R. C., Putman, J. A., and Lockhart, R. W.: "Two-Phase, Two-Component Flow in the Viscous Region," *Trans. AICE*, (1946) 42, 681-705.
[8] Perry, J. H.: Chemical Engineers Handbook, Third Edition, McGraw-Hill, (1950) 378.
[9] Van Wingen, N.: *World Oil*, (1949) 129, 156.

ACKNOWLEDGMENT

The authors express appreciation to Sinclair Oil Company and Gulf Oil Corporation for financial support of the fellowships which helped make this investigation possible. Presented at AIME Fall Petroleum division meeting in Dallas, October, 1953.

—**The End**

The Case of the Misbehaving Bridge

Continued from Page 45

El Paso Natural men took measures to keep the bridge from pulling herself apart until the remedy could be administered.

Using the knowledge that had been gained via rowboat, the company installed at the center of the span a cable which dropped to an empty oil drum floating in the river. From the oil drum, a cable and anchor were dropped to the river bed.

At Fluor's Los Angeles laboratory, wind-tunnel tests were made, using a model of the bridge which proved that the cylindrical structure of the bridge span caused eddies to form at wind-speeds of from 3 to 6 miles per hour, causing a minute lifting and lowering of the span. These movements, if they continued with no interruption of the vibration cycle, mounted in intensity until they reached destructive proportions.

Much the same effect can be created by a small boy in a swing. By using the same amount of push, timed correctly, the boy can swing himself higher and higher until, theoretically, he goes "over the top" and does a complete loop.

The wind had to be of the right speed and from the right direction to cause these oscillations at the bridge. At wind speeds of 6 miles and over the oscillation cycle was broken, and the vibrations began to work against one another, thus stopping the action. Company engineers turned up the peculiar fact that the breeze at Ehrenberg bridge blows predominantly up and down stream. Dry, "light" winds blowing in from the desert hit the cooler, denser air hanging over the Colorado River.

If they are not powerful enough to break through the wall formed by the cooler, heavier air, they are turned, and flow at right angles to their original direction, up and down stream. It is wind or breezes of less than ten miles an hour (those which are most likely to put the bridge into her bump-and-grind act) which always flow along the course of the stream.

This flow of cooler air, incidentally, caused the temperature drop which so puzzled El Paso engineers at the beginning of the testing.

From the wind-tunnel test, it was determined that one sure way of eliminating the buckinghorse characteristics of the bridge was to stop the vibrations before they started. This could be done by breaking up the smooth, rounded contours the pipe line span offered to the wind, so conducive to deadly little eddies which formed evenly along its length, setting up the vibrations.

The method arrived at for breaking up these eddies was the installation of 14 horizontal light metal fins to the pipe span. These fins are triangular in shape and are attached to alternate sides of the pipe all the way across the span, from pylon to pylon.

From above and below they give the effect of jet-like wings to the pipe span. But their function is exactly the opposite. They are designed to keep the bridge at rest, and they have performed their job to perfection. Ehrenberg bridge, once the restless problem child of the Southern Mainline, has now settled down to a quite and useful life, and the "Case of the Misbehaving Bridge" is a part of El Paso Natural Gas Company's records, marked "solved."

—**The End**

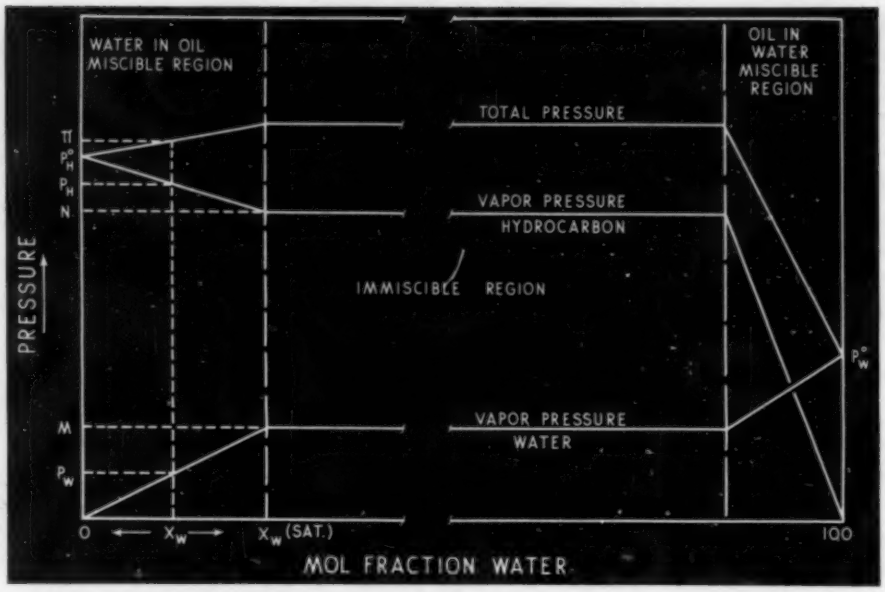


Fig. 1—Typical phase curve for hydrocarbon-water system.

Dehydration of Light Hydrocarbon Liquids

Part 1: Dehydration methods

Part 2: Regeneration methods and design factors

Part 3: Distillation drying and testing for water content

By JOHN M. CAMPBELL, Assistant Professor Petroleum Engineering, University of Oklahoma, Norman, Okla.

THERE ARE A number of process reasons why it is often expedient to remove water from hydrocarbon fluids. Among these are prevention of corrosion, freezing, interference with desired chemical reactions and to improve the general physical properties.

The method used for such removal is normally contingent upon the properties of the fluid, the degree of mutual solubility and the quantity of water involved. The following general processes are therefore used:

1. Evaporation
2. Extraction
3. Refrigeration
4. Distillation
5. Adsorption
6. Decantation (gravity separation).

The term "dehydration" as used in the petroleum industry normally applies only to the removal of relatively small quantities of water with a high degree of efficiency. Evaporation therefore is not applicable while decantation is only effective in the range of concentrations where the fluids are immiscible. Of the remaining methods, refrigeration is expensive and shows no significant process advantage over other methods. Extraction may be used but to date few such installations have been made and then only for specialized applications. Use of the glycols offers promise in this service but as yet there has been little demand in liquid service, although they are commonly used in gas dehydration.

Inasmuch as this discussion will be limited to gasoline plant and product pipe line fluids, only adsorption and distillation will be considered in detail.

Properties of solutions. The majority of the light hydrocarbons are virtually insoluble in water. This is illustrated in Figure 1, which is a schematic representation of a phase diagram for two partially soluble liquids at a given temperature. The relative position of the lines is a function of temperature and the liquids involved, but those shown may be considered typical. The water-in-oil and oil-in-water miscible regions are normally very narrow and in these normal solution equilibrium relations apply. The sum of the partial pressures for each component equals the total pressure. For example,

$$P_w + P_h = \pi \qquad (1)$$

Where

P_w = partial pressure-water

P_h = partial pressure-hydrocarbon

π = total pressure

In the immiscible region each of the components essentially exerts its vapor pressure, hence composition has no effect on the total pressure and the lines are essentially parallel to the abscissa. The position of the line X_w, the mol fraction of water at saturation, is proportional to the temperature for a given hydrocarbon-water system. Consequently at reduced temperatures the amount of water in solution at saturation is correspondingly reduced. As the temperature is lowered beyond the saturation temperature a free water phase appears. The normal dehydration problem is therefore to reduce the initial water concentration to a point where the saturation concentration is not exceeded at the lowest temperature attained by the liquids.

In product pipe lines this latter temperature is normally referred to

as the "low line temperature," e.g., the lowest temperature anticipated in the line. For light hydrocarbon liquids and other fuels the final allowable water concentrations are fixed by test procedures rather than by temperature alone. In such cases it is customary to require exit water concentrations not exceeding 10-20 parts per million by weight.

The effect of temperature on water solubility is more clearly illustrated in Figure 2. The curves represent the solubility of water in many common light petroleum fractions. Such published solubility data are often in disagreement so those shown may be considered only as typical. Marked differences exist, particularly on fluids that are composites and are manufactured by various methods. Cracked and/or reformed gasoline, for example, will show different solubility characteristics than straight run.

If a liquid represented by point "A" is cooled the water content will not change until the saturation point "B" is reached. This is commonly referred to as the "cloud point," e.g., the point at which a free water phase appears and the liquid becomes cloudy. This temperature is entirely analogous to the "water dew point" of a gas. If the liquid is further cooled the solubility curve is followed until say point "C" is reached. A finite quantity of free water is then present, the quantity of which is represented by the distance A-D.

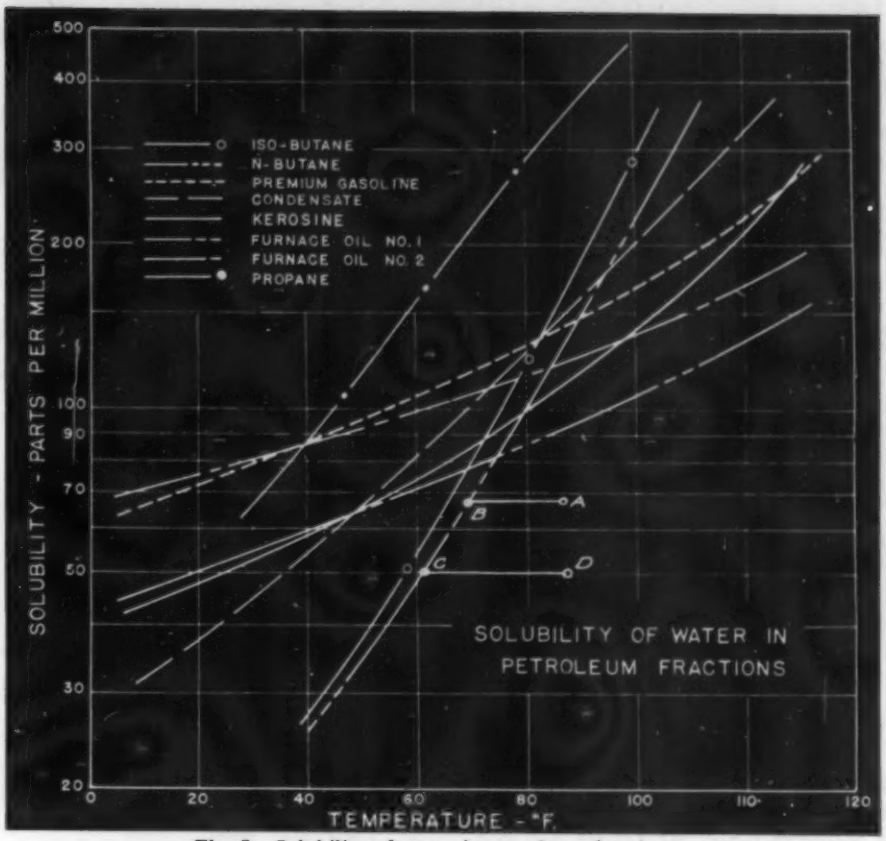


Fig. 2—Solubility of water in petroleum fractions.

Dry Desiccant Systems. The use of dry desiccant is by far the most common method of dehydrating hydrocarbon liquids. The desiccants used in this process should have the following basic characteristics:

1. High water capacity.
2. Rapid water adsorption rate.
3. High efficiency at varying temperatures, concentrations and liquid rates.
4. Economical regeneration.
5. Little resistance to liquid flow.
6. Activity retained after repeated regeneration.
7. High mechanical strength.
8. Cheap, non-corrosive, non-toxic, chemically alert and have a high bulk density.
9. No appreciable volume change on wetting and should not become sticky or liquid.

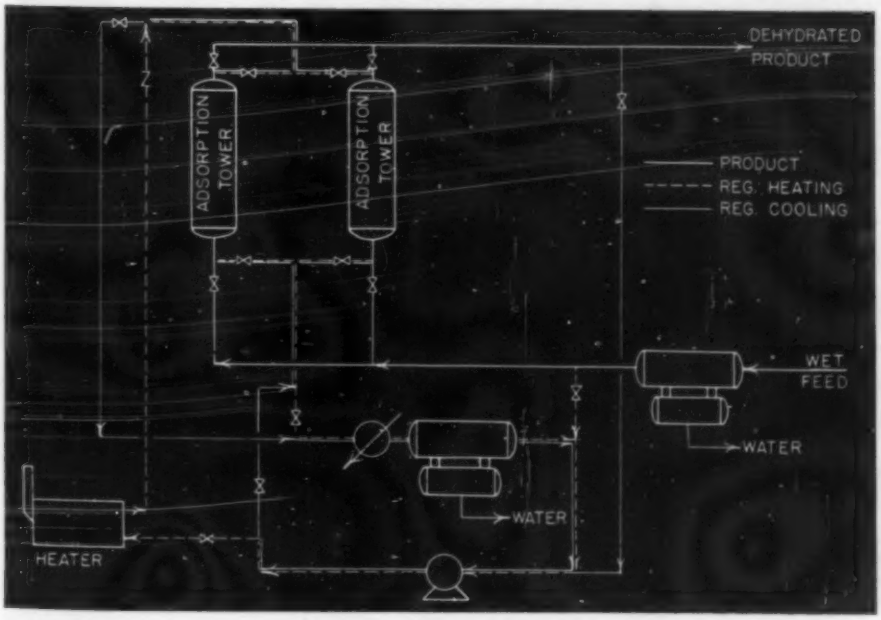


Fig. 3—Flow diagram for a closed vapor system.

The general properties and limitations of various desiccants have been previously discussed.[24]

The aluminum oxide or bauxite type desiccant is used in virtually all existing plants. In those instances where the liquid to be dehydrated is sour it is often desirable to use a desiccant with a low iron content such as activated alumina. Some use of the gel type desiccants has been reported but their use at present, in this service, is negligible. There is some evidence, however, to indicate their superiority in the dehydration of liquids containing mercaptans. If used though extra precautions are nec-

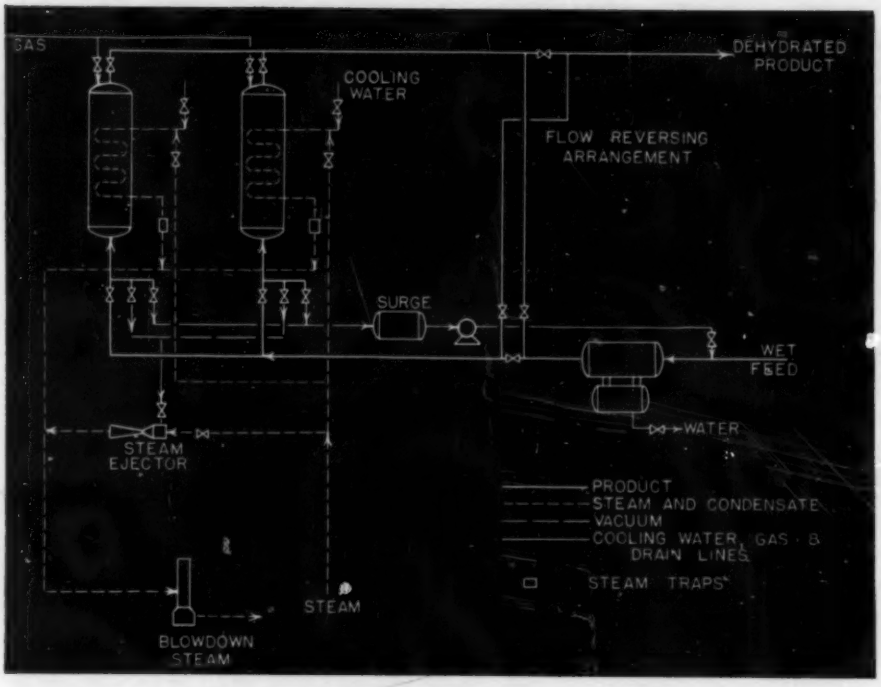


Fig. 4—Flow diagram for a natural gas system.

essary to prevent their contact with substantial quantities of free water.

All dry desiccant plants are substantially the same except for the means used in regenerating the desiccant. The three most common approaches are summarized in Figures 3, 4 and 5.

In each provision is made to remove all free water from the liquid entering the dehydrator. The raw feed then flows either upward or downward through the drying tower before passing to sale or storage.

Many plants are so arranged that the flow may be either upward or downward. Of the two, upward flow offers the most advantage for it enables countercurrent regeneration downward. This in turn offers advantage since the gas to replace the hold-up stock is most conveniently introduced at the top. With upward flow, also, a free water knockout section may be incorporated in the bottom of the tower. At the low liquid flow rates encountered, desiccant dusting in the top of the bed is not a significant factor.

Although only two towers are shown in Figures 3-5 many plants utilize more. Four towers are very common and when used there are several approaches:

1. Use of two towers on stream in parallel, with one being regenerated and one cooled.
2. Operation with two towers on stream in parallel at any one time, two regenerating.
3. Use of three towers on stream at one time with one regenerating and cooling.

Alternative 3 normally involves the use of the multiple towers in parallel, unless very low dew points are needed, since series operation requires larger diameter vessels. In such event the freshly regenerated bed is last in series.

Method 2 has merit from the standpoint of simplicity even though the cloud point varies throughout the cycle, as each bed becomes progressively more saturated. Method 3 has the advantage of more uniform cloud points throughout the cycle.

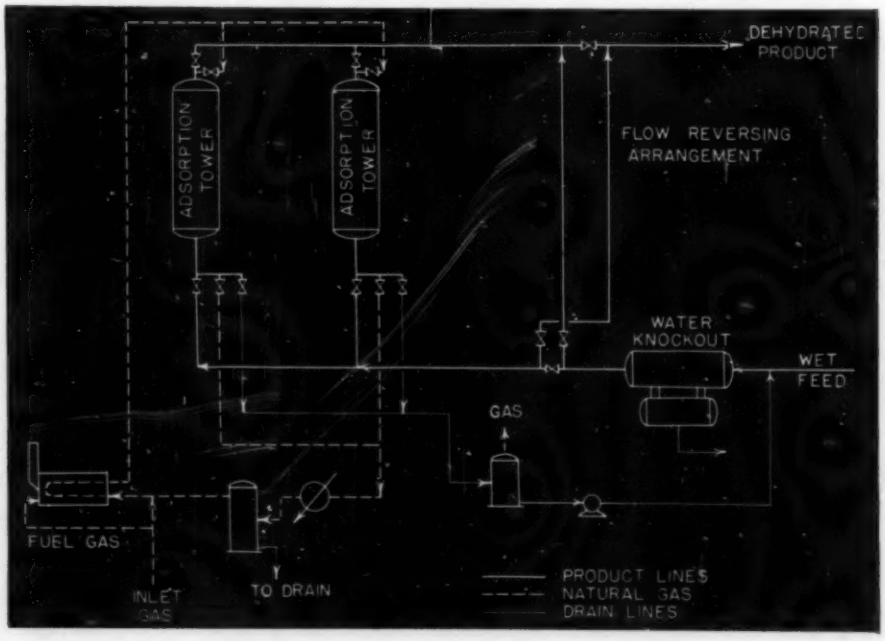


Fig. 5—Flow diagram for a closed steam system.

BIBLIOGRAPHY

[1] Amero, R. C., Moore, J. W., and Capell, R. G., Chem. Eng. Prog., 43, No. 7, 394 (1947).

[2] Anonymous, Flow Line, March-April (1944).

[3] Black, Joris, and Taylor, "Preliminary Report on the Solubility of Water in Hydrocarbons," Report Hc Cl-2, Tech. Adv. Comm. of the Pet. Ind. War Council, May 3, 1943.

[4] Boyd, Layton, Oil Gas Jour., Dec. 8, (1952).

[5] Campbell, J. M. and Huntington, R. L., Petr. Ref., 31, No. 2 (1952).

[6] Derr, R. B. and Willmore, C. B., Ind. Eng. Chem., 31, 866 (1939).

[7] Dougherty, R. P., Petr. Engineer, June (1952).

[8] Fisher, H. E., Oil Gas Jour., Oct. 6, (1949).

[9] Gester, C. G., Chem. Eng. Prog., 43, No. 3, 117 (1947).

[10] Griswold, J. and Kasch, J. E., Ind. Eng. Chem., 34, 804 (1942).

[11] Hachmuth, K. H., Western Gas., Jan., 55 (1932).

[12] Heldebrand, J. H., "Solubility of Non-Electrolytes," Reinhold Publishing Co., New York, New York, 2nd Edition (1936).

[13] Kobayashi, R. and Katz, D. L., Ind. Eng. Chem., 45, 440-51 (1952).

[14] Ledoux, Edward, Chem. Eng., March (1948).

[15] McKetta, J. J. and Katz, D. L., Ind. Eng. Chem., 40, 853-63 (1948).

[16] N.G.A.A. Bulletin No. 2140 and NGSMA Data Book (1951).

[17] Phipps, H. K., Presented API, Chicago, Ill., Nov. (1946).

[18] Schulze, W. A., Morris, L. D. and Alden, R. C., Oil Gas Journal, 40, No. 26, 172 (1941).

[19] Smith and Bryant, J. Am. Chem. Sec., 57, 841 (1935).

[20] Stowe, V. M., Jour. Phys. Chem., 56, 487, (1952).

[21] Stowe, V. M., Jour. Phys. Chem., 56, 484, (1952).

[22] Smith, W. E., and Leva, Max, Pet. Proc., Vol. 8, 8, 1194 (1953).

[23] Campbell, J. M. and Laurence, L. L., Pet. Ref., 32, 3, 151 (1953).

[24] Campbell, J. M. and Laurence, L. L., Pet. Ref., 31, 10, 106 (1952).

—End of Part I

Rules of Thumb

FOR THE PIPELINER'S NOTEBOOK

$15 Per Rule of Thumb

These formulae from the pages of engineers' own notebooks yield rough, but reasonably accurate answers for design, maintenance and supply questions. The Editors will pay $15 for your pet Rule of Thumb. Send your Rule of Thumb to Donald M. Taylor, Editor, PIPE LINE INDUSTRY, P. O. Box 2608, Houston 1.

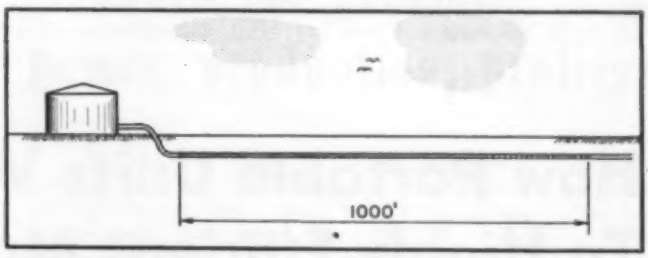
Miscellaneous —17—What is the line fill for a given pipe line?

Editor's Note: Since PIPE LINE INDUSTRY and its parent magazine, WORLD OIL started this feature in the December 1952 issue, many readers have submitted this particular Rule of Thumb to us. WORLD OIL first ran it in the January 1953 issue; but for the many new subscribers who have joined us since that time, we are repeating it and adding a few variations that came in from our readers.

RULE: To find the line fill for a given pipe line in barrels per mile, square the inside diameter of the pipe and multiply by 5.13. The answer is in barrels per mile.

Example: How many barrels of oil in a mile of schedule 40 six-inch pipe. (The i.d. is 6.065 inches)

Solution: 6.065 x 6.065 x 5.13 = 188.7 barrels



RULE: For a close approximation, to find the barrels per 1000 feet in a pipe line, simply square the nominal pipe diameter.

Example: How many barrels of oil in 1000 feet of 20-inch pipe line?

Solution: 20 x 20 = 400 barrels

Miscellaneous —18—How many cubic feet of gas in a mile of pipe line?

RULE: To find the number of standard cubic feet of gas in a mile of pipe line multiply the pressure times the square of the diameter times two. The answer is a close approximation to the actual number of standard cubic feet.

Example: How many cubic feet (standard cu. ft.) in one mile of 30-inch pipe if the average pressure is 500 psig?

Solution 500 x 30 x 30 x 2 = 900,000 cu. ft. of gas in a mile of pipe line.

THREE PORTABLE PUMPING UNITS were moved to Weller, La., and a permanent pump station was built around them. Originally the units had been purchased for temporary use on Interstate Oil Pipe Line Company's southern Louisiana system. But they proved so efficient that they were changed to dual fuel and are used in this permanent installation.

How Portable Units Were Converted To Highly Efficient Main Line Stations

The lube oil is never changed, filtered, or centrifuged in these converted dual fuel engines. And the lube oil consumption is low.

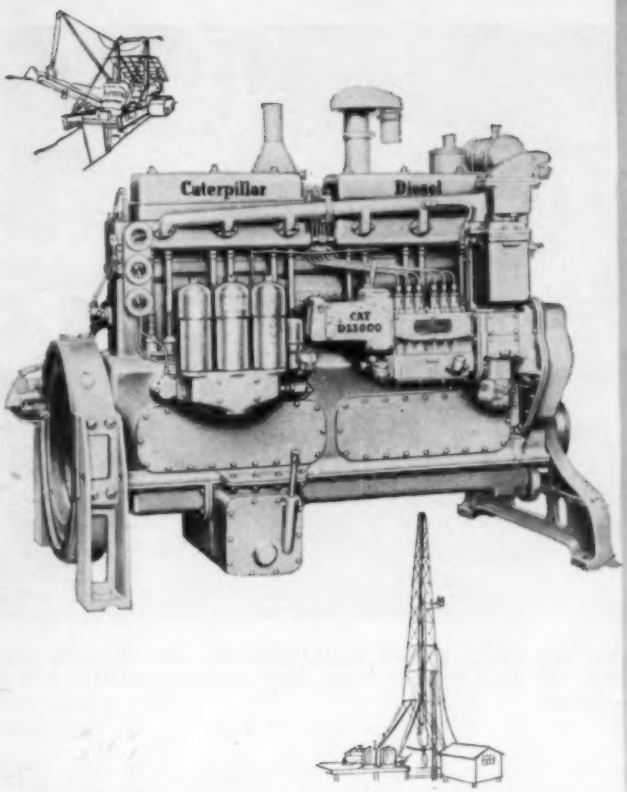
By WILLIAM LAW, Interstate Oil Pipe Line Company, Shreveport, La.

RECOGNITION of the efficiency and stamina of the new production items of equipment, the growth of confidence in the reliability of instruments and controls, plus the willingness to accept new ideas in place of old have made possible several changes and economies in permanent trunk pipe line stations for the Interstate Oil Pipe Line Company.

Two new 60,000 barrel per day stations, at New Iberia in South Louisiana and Weller in North Louisiana, are examples of the new trend and indicate the efficient practical down-to-earth stations which can now be built at low cost from standard production equipment which is readily available.

While they are far different from the old idea of what a permanent trunk pipe line station should be, and though their first cost is much less, their operating cost is also less. Although they were designed primarily to pump oil, with emphasis being placed on utility, due consideration was given to safety, ease of operation and operator comfort and to being sure that stations did not offend the eye, ear or nose of the passing public.

Portable units were converted. Both of these stations were designed around three portable pumping units



Announcing the

NEW 190-HP CAT* DIESEL ENGINE

CATERPILLAR ADVANCED DESIGN FEATURES IN THE NEW D13000

While retaining such time-proved features as aluminum alloy main and connecting rod bearings, "Hi-Electro" hardened and Superfinished bearing surfaces, exclusive Caterpillar fuel injection system, ability to use low-cost No. 2 furnace oil without fouling, etc., the new D13000 incorporates many new features, among them:

NEW Valves, Inserts, Rotators—new components, standard in the breathing system, combine increased breathing ability with longer valve life—make possible additional horsepower output and lower maintenance costs.

NEW Vibration Damper—sturdy, metal-enclosed, fastened directly to front of crankshaft. Keeps unit vibration-free at higher speeds. Optional in installations where engine speed is kept below 1000 r.p.m.

NEW Camshaft—improved high lift cam profiles give smooth valve seating and increased breathing ability. This increased capacity, also made possible by new oil-bath air cleaner and larger intake and exhaust manifolds, insures low exhaust temperatures and adequate reserve power.

NEW Water Pump—larger, with a greatly increased capacity to answer cooling needs of this modern, high-powered diesel.

NEW Pistons—oil-cooled, made of high-strength, lightweight aluminum alloy with stainless-steel heat plugs in the high-temperature zone and cast-in iron bands for the top ring groove to give best service at lowest final cost.

NEW Oil Pump—features not just one, but two pressure controls to assure correct lubrication for all moving parts from the first turn of the crankshaft.

For complete details, specifications, attachments, etc., see your nearby Caterpillar Dealer

...yours for greater power, production, profits!

For years, covering all oil field operations from drilling and pipeline construction to pumping, the Caterpillar D13000 Engine has proved itself a big money-maker for power users. Now, here's a new D13000, designed to bring you even greater power, production and profits.

In the new D13000, you get 21% more brake horsepower. Its governed speed, raised to 1200 r.p.m., provides greater versatility and productive capacity. While keeping outstanding, time-tested parts, it adds advanced design features to set new standards of stamina, dependability, economy and long life. And its wide variety of matched accessories and attachments makes it readily adaptable for any need.

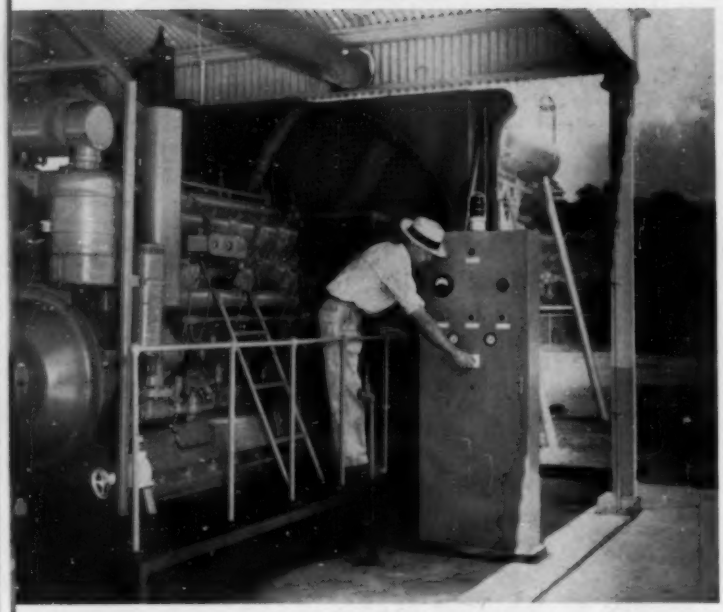
For jobs requiring power in the 145 (continuous) to 190 (intermittent) horsepower range, your best buy is this rugged new Cat D13000 Engine. Leading manufacturers of drill rigs, ditchers, compressors, shovels and other heavy-duty machinery can furnish it in their equipment. Leading supply stores can furnish it as part of their oil field package. Get the *complete* facts about it today from your nearby Caterpillar Dealer.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

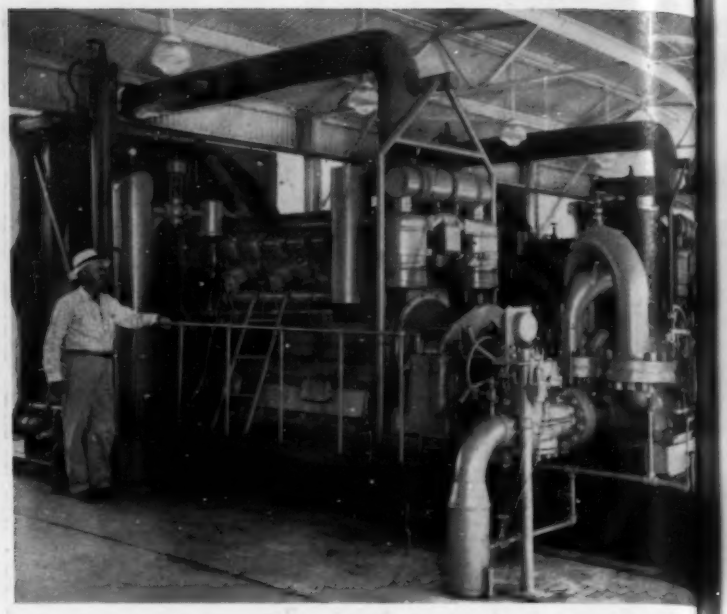
CATERPILLAR*

*Both Cat and Caterpillar are registered trademarks—®

D13000—
A NEW STANDARD
OF OIL FIELD POWER



OPERATOR STARTS ENGINE from panel board. The pumping units are semi-automatic and require only one operator per tour.



INSIDE OPEN PUMP BUILDING the three portable pumping units have found a home. Note the large radiator near the operator.

which are piped for series operation. Each pumping unit consists of a 12 cylinder 400 brake horsepower dual fuel engine, cooled by a radiator at Weller station and by a heat exchanger at New Iberia station, driving a three-stage centrifugal pump through a speed increaser and mounted upon a structural steel base. The weight of each unit is 36,000 pounds. Nominal capacity of each unit is 60,000 barrels per day at 300 pounds per square inch at 80 percent pump mechanical efficiency.

These units were purchased as portable units to meet a temporary emergency need. If any thought was given to their future use at end of emergency need, it was that they would be used only in similar temporary service elsewhere, since the misconception existed that they did not have the stamina to meet the demands of permanent trunk line station duty.

This idea was not changed and they were not accepted as suitable for permanent pipe line station duty nor were the engines accepted as suitable prime movers for this service on hearsay.

The units sold themselves by proving in over a year's operation in booster service that they had the qualities needed. While in this service, they were set up, three units in series, to pump 61,000 barrels per day at 860 psi at 1100 engine revolutions per minute, 3300 pump rpm, with higher speeds permitted intermittently. This required an engine output of 400 bhp at 1100 rpm or 115 bmep at 1466 feet per minute piston speed.

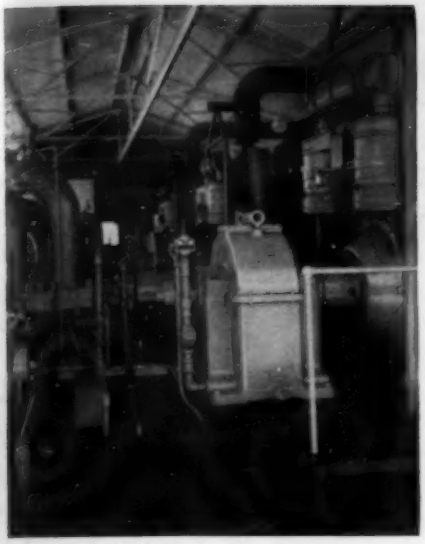
Engines were converted to dual fuel. This booster service was not only a proving period for the unit as a whole, which indicated several minor changes needed, and for the engines as purchased (supercharged diesels), but also provided a time for testing and demonstrating the capacity of the dual fuel version of this engine. Without this actual demonstration, regardless of economy promised, we would never have specified or used the dual fuel engine. In converting the diesel, the supercharger was removed and the compression lowered.

In spite of assurances that the more efficient combustion of the dual fuel system and the closer approach to the Otto cycle enabled the engine to carry the loading easily, we didn't believe it. We were convinced only after months of dual fuel service and examination of the parts from a dismantled engine that a naturally aspirated engine could carry up to 115 bmep at 1466 feet per minute piston speed and stay together.

Engines were dismantled and checked. Prior to installation at New Iberia station and Weller station, six units were trucked to the manufacturer's representative's shop for complete dismantling, inspection, repair and conversion to dual fuel. The total cost of repair parts for all six engines after over a year's operation was $59.80 for gaskets only, since it was not necessary to replace any other part due to wear. This, in addition to the actual dual fuel performance we had seen, convinced us that these engines would stand up and were worthy of consideration for any service. Recent inspection at New Iberia, after an additional year's service has confirmed this as the following typical measurements show:

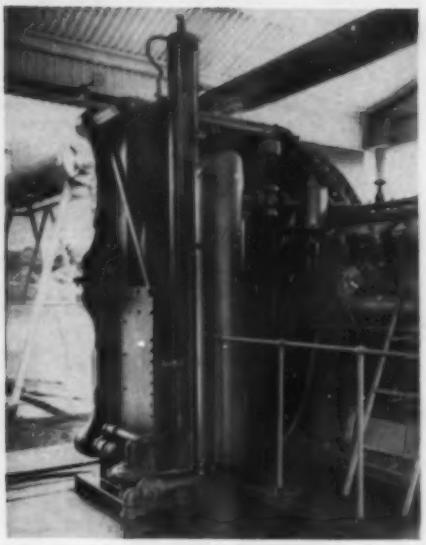
- Total dual fuel hours on engine — 10,722 — bearing and journal wear not measurable, if any
- Hours on liners—10,722—maximum liner wear—.0009 inch
- Hours on pistons—10,722
- Piston ring side clearance increase—less than .001 inch per 1000 hours of operation, maximum
- Piston ring gap clearance increase, approximately .001-inch per 1000 hours of operation, maximum.

It should be mentioned here that the testing of the dual fuel conversion, which was planned and supervised by the research personnel of the engine maker, started a pleasant and valuable three-way association between them, their sales representatives and the Interstate Oil Pipe Line



SPEED INCREASER has shutoff in case of low gear lube oil pressure.

SUCTION PRESSURE TRANSMITTER and gauge mounted alongside station low-pressure shutdown device and unit low-pressure safety shutdown device.



GAS VOLUME CHAMBER is the vertical pump in foreground. Tall pipe nearest radiator serves as surge tank for giant radiator. Section of radiator cools lube oil.

Company personnel which still continues and has resulted in improved equipment, performance and some departures from established operating practices which are saving labor and money. Without this cooperative effort, the dual fuel conversions would not have been available for a year or more. Some ideas are still under joint test.

Stations are operated by one man. The operation of these stations by one man per four is made practical by the full use of instruments, alarms and controls. They not only protect personnel, equipment and continuity of operation, but also relieve the operator of the burden of repetitious readings and take over the responsibility for control observations and speed and pressure control.

The engines are equipped with pneumatic positioned hydraulic governors. Speed control and pressure transmission are pneumatic. Each unit has an individual control panel from which it may be operated manually in addition to the main control panel in the station office, from which the units may be operated either manually or automatically. This main control panel also has automatic tank gauge dials.

The following events are noted by an alarm and a red light on either the unit panel, the main panel or both:

- High level in sump
- Low suction pressure
- High engine jacket water temperature
- Low engine lube oil pressure
- High, speed increaser, lube temperature
- Low station air pressure.

The following variables may be controlled either manually or automatically, or both:

- Engine and pump speed control
- Station suction pressure
- Engine cooling water temperature
- Automatic shut off of gas on shutdown
- Automatic pumping of station sump
- Automatic tank gauges

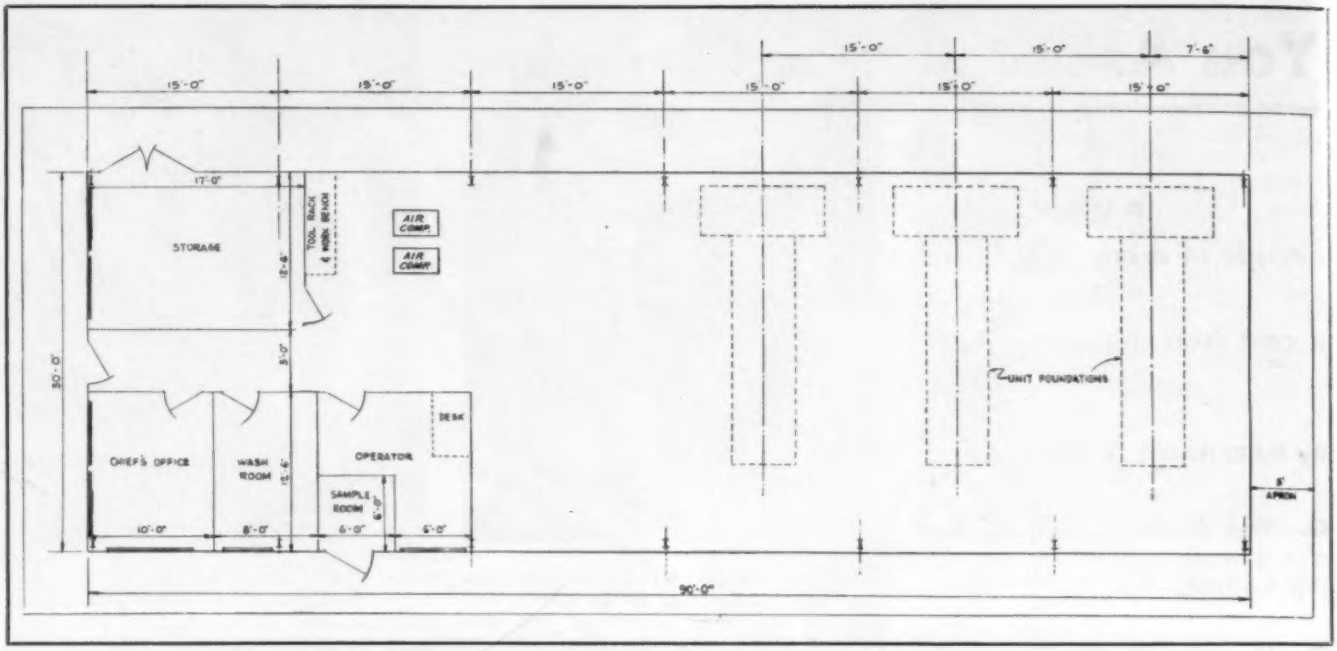
In addition to these, New Iberia has a telemetering system that controls line pressure at a point 13 miles from the station.

The above are in addition to the usual overspeed low lube oil pressure and high water temperature shutdown devices, tachometers, pyrometer and thermometers normally used.

Only one station on southwest system. The operating conditions of the two stations are vastly different. New Iberia operates under somewhat difficult conditions. Being the only station on the Southwest system, its ability to perform is vital to the operation of the entire system and to the flow of oil from about a dozen oil fields. As it is located near the middle of the pipe line, it must receive the oil from the fields south of it—about 40,000 barrels per day —and move it to Anchorage terminal while bucking the variable line pressure caused by the injection of about 45,000 barrels per day into the line at 12 points between New Iberia and Anchorage. Furthermore, while doing this, it must act as pressure regulator for the system and vary its pumping inversely to the rate of injection so that pressure will not exceed 725 psi at a point 13 miles north of the station.

As it is impractical and uneconomical to regulate flow of oil from fields so as to permit tight line operation of the station, a 50,000 barrel floating roof tank is provided to hold the excess of receipts over deliveries. An engine driven booster pump is required to provide adequate suction pressure to meet the NPSH requirements of main unit pumps and the pressure drop through the jacket water-crude oil heat exchangers, which at New Iberia replace the original radiator cooling systems. The station pumping rate may vary daily from 15,000 bpd to 60,000 bpd depending upon rates of injection.

Weller station. Weller station operation is ideally simple. Suction is taken from tanks whose elevation is sufficient to overcome line loss and to provide ample positive suction pressure at the volumes being pumped. By retaining the original radiator installation, the expense and trouble of a booster pump and heat exchanger system is avoided. While there is one injection point on the line between Weller station and Finney station, the volumes are such so that no special complication results. This new three unit station replaces



FLOOR PLAN OF NEW STATION measures 90 by 30 feet. Old station was 205 by 40 feet.

an old three unit slow speed air injection diesel engine-reciprocating pump station, which had suffered the ravage of time and sour crude. The station pumping rate is usually fairly uniform, but may vary from 20,000 bpd to 50,000 bpd.

Engine lube oil is never changed. Some departures from accepted lubrication practices have been introduced. The lubricating oil is not changed. While the oil is strained through metallic screens, no filters, centrifuge or other means are used to clean the oil. The thought was expressed that since dual fuel combustion was so complete and operating conditions so clean that lube oil would not be contaminated and need little cleaning. The present practice was started several months back with careful analysis and inspection of the lube oil at regular intervals to check deterioration of the oil, if any.

After over 4000 operating hours, inspection shows oil to be in excellent condition. **It appears now that, except in case of an accident such as excessive fuel dilution or water, that oil may run indefinitely without a complete changing.** That a condition of equilibrium has been reached where the qualities lost in the used and consumed oil are rebuilt by those of the new oil added, to well within safe limits.

Oil is not filtered or centrifuged. Of importance, in addition to the monetary saving represented by waste of good oil and cost of filter packs or centrifuging, is the fact that the operator is relieved of the labor and mess of changing filter packs and disposing of the used pack. **Lube oil consumption is low.**

Fuel economy. Maximum engine speeds of 1100 rpm and maximum exhaust temperature of 950° F. have been set to protect engines from being overloaded.

The engines run as dual fuel except for a few minutes a day when they are switched to full diesel to clear injection valves. Pilot fuel (refined diesel fuel) supplies from 5 percent to 9 percent of the power with natural gas supplying the balance.

Tests on fuel ecenomy have shown that rates will be from 7200 Btu bhp hour to 7900 Btu bhp hour. However, as stations such as New Iberia rarely operate for any length of time at loading for best fuel consumption, the actual use rates will be closer to higher figures.

Station maintenance. Over-all maintenance cost per barrel pumped of these stations is expected to compare favorably with that of larger capacity stations with larger units. The buildings should require less maintenance than the closed type and the tanks, lines and auxiliary equipment should require about the same as for other stations. Unit maintenance cost per barrel pumped is expected to approach that of the larger units.

While overhaul of units will be more frequent, it is believed that the low cost of parts and ease of repair will even out final maintenance cost figures after a few years. Although this is an assumption based upon only one year's experience, we believe it will be fairly correct since it is based upon actual wear measurement.

Buildings. Both station buildings are assembled from standard shed type mill building sections with monitor louver added and one end closed to house auxiliary equipment, office and other needed space. This type building is adaptable and has some advantages for our climate and work. They are safer, provide better ventilation and are easier to keep clean and maintain than the closed buildings, while giving ample weather protection. The concrete floors of these buildings are extended five feet beyond wall line and sloped for drainage, making an apron which serves as a walkaway and aids materially in housekeeping. There are few dark corners to accumulate tash in these buildings. No permanent overhead crane is provided since all parts can be handled from a light wheeled "A" frame. The stations are well lighted both day and night.

The New Iberia station building is 30 feet by 60 feet and only room for the auxiliary equipment and an operating office is provided in the building, in addition to unit space required, as warehouse and toilet facilities are

Continued on Page 84

You Asked About Corrosion . . .

MARSHALL E. PARKER

• Why do gas service lines corrode badly just outside of a concrete basement?

• How may gas service lines be insulated from a cast iron main?

By MARSHALL E. PARKER, Consulting Corrosion Engineer

Q.—Why do gas service lines corrode badly just outside of a concrete basement wall? What can be done about this condition? S. A. A.

Q.—How may gas service lines be insulated from a cast iron main? If a bushing or collar is used, the service is all isolated from the main, except the tapping fitting itself. K. T. L.

A.—These two questions are grouped together, because the same phenomenon is involved in each; in the first case, it is the villain, and in the second, the hero.

Galvanic cells may be set up, in the soil or in any other electrolyte, by coupling together two different metals or alloys. They may also be created by having two pieces of the same metal (or two parts of the same piece of metal), electrically connected together, and lying in two different electrolytes. This is the case with the gas service line which passes through the concrete wall; concrete is an electrolyte, and is quite different from almost all soils. With few, if any, exceptions, steel imbedded in concrete is cathodic with respect to steel in soil—the potential difference can go as high as 0.3 volt. Thus the short section of line within the wall is a cathode, and that outside, in the soil, is an anode; naturally, the attack will be concentrated on the pipe which is just outside the wall, and here the trouble develops.

The remedies for this condition vary with the time at which the trouble is recognized. On new construction, this difficulty may be averted by jacketing the pipe through the wall with several layers of pipe line felt or a similar substance; or, perhaps better still, a bushing or conductor pipe may be installed, through which the service line is passed. On existing installations, cathodic protection offers the simplest approach to the problem; if it is desired to protect the entire service, it should be insulated both from the main (unless the latter is being protected) and from the water lines within the house. If no such comprehensive protection program is contemplated, then the installation of a small magnesium or zinc anode very close to the point of attack will serve to alleviate the trouble.

The second question refers to a problem frequently encountered by utilities attempting to protect service lines connected to cast iron mains. When there is no protection program at all, the entire service (and through it, the water piping) is connected to the cast iron main. Since the cast iron is almost always cathodic, the damage is thus distributed over the whole service. When an attempt is made to insulate the services, however, the first point where such insulation is feasible is at the junction of the tapping fitting and the service line itself. Since this fitting is usually steel or malleable iron, either of which is anodic to cast iron, this leaves in existence a cell with a large cathode (cast iron) and a small anode (steel); in such a cell, destruction of the anode is likely to be quite rapid.

Advantage can here be taken of the phenomenon mentioned above; if the tapping fitting is encased in concrete or mortar, it will then be slightly cathodic with respect to the cast iron main, and we will have a cell with a large anode and a small cathode—and from such a cell there will be no very destructive action, because of the distribution of the attack over the wide area of the anode. Thus a state of affairs which is sometimes harmful can be turned to our purposes, and offer an assist in the never-ending battle against corrosion. **—The End**

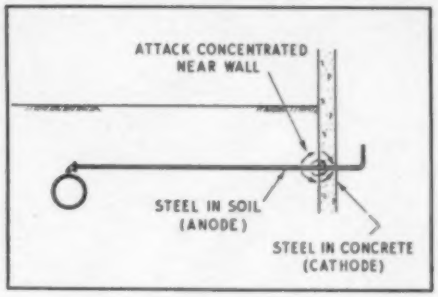


Fig. 1—Attack on gas service line at building wall. Steel in concrete is cathodic with respect to steel in soil; attack is concentrated within a few inches of wall. If section of pipe through wall is bare, attack can be very severe at the edge of wall.

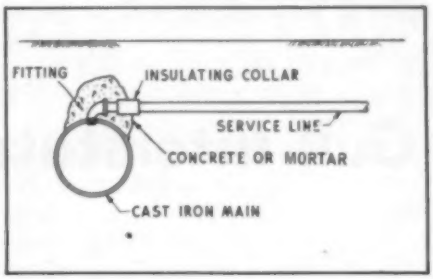


Fig. 2—Protection of insulated service line from cast iron main. Insulated joint cannot practically be installed between cast iron main and steel service line, but must leave at least one fitting connected to main. This fitting can be made cathodic with respect to main by imbedding it in rich mortar.

Aerial view of construction on . . .

Gulf Interstate's New Streamlined System

Every new line brings out some innovations. And here's a company that introduced several, including an ingenious emergency repair kit and pushbutton compressor station.

By DONALD M. TAYLOR, Editor, PIPE LINE INDUSTRY

On November 1, just 17 months and 12 days after the Federal Power Commission authorized its construction, the $130 million Gulf Interstate Gas Company is scheduled to go in operation. There is little doubt but what the new company will start as scheduled, since construction is virtually complete and the operating crews are now in the last phases of testing and tune-up.

The speed of construction and the slick engineering designs make the Gulf Interstate system one of the most remarkable accomplishments of the great postwar pipe line boom. From the time the FPC certificate of convenience and necessity was issued on May 20, 1953, it was less than three months until the first pipe was laid in the ground on August 10th. In the brief four months that followed this event, contractors laid all but 200 miles of the 845-mile, 30-inch main line and most of the 315-mile gathering system as well.

The purpose behind the organization of this new company is not to buy or sell gas, but to transport it for the Columbia Gas System as a contract carrier. A Columbia subsidiary, United Fuel Gas Company, is responsible for acquiring and developing sufficient reserves to insure a continuous supply. Gulf Interstate simply receives the gas in south Louisiana and delivers it back to United Fuel at Means and Leach, Ky. Here the gas enters Columbia's pooled supply for distribution to its subsidiary operating companies and eventual use by more than three million consumers in a seven-state area and the District of Columbia.

How the line was laid . . .

Gulf Interstate's tight schedule meant that engineering and construction had to proceed at a record breaking pace.

Few people—even pipeliners—realize how gigantic is the total mass of material and labor that goes into construction of a pipe line. For instance, to cut the ditch and backfill the pipe on Gulf Interstate's new system, pipeliners had to move more than 19 million cubic yards of earth. Expressed in weight, this amount of dirt would tip the scales at more than 50 billion pounds. Heaped up, it would make six pyramids the size of the Great Pyramid of Gizeh in Egypt that originally was 482 feet high with a base that covers nearly 13 acres.

The 1160 miles of pipe that went into the system weighs 309,622 tons. This is heavier than 77 fully loaded freight trains of 100 cars each, counting the weight of locomotives, cars and all.

These and other figures from the accompanying table, simply point up the gargantuan physical task that confronted the personnel of Gulf Interstate and the various contractors as they set about constructing the system just a little over a year ago.

What It Took to Lay the Gulf Interstate Line

1. Length of Line When Completed	
Main Line 30 Inch	845 Miles
Lateral & Gathering Lines	315.0 + Miles
Total	1160 Miles
2. Pipe Tonnage	
Main Line	264,319 Tons
Lateral Lines	42,122
River Crossings	3,221
Total Tons	309,662
3. Cubic Yards of Dirt Moved In	Estimated Cubic Yards
Main Line Ditching Only	5,703,000
Lateral and Gathering Lines	1,133,000
Mississippi River (4 Lines)	8,525,000
Others Including Minor River X-ings	3,826,000
Total	19,187,000 Cubic Yards
4. Material Other Than Pipe Totals (Estimated)	
A. Enamel	19,642 Tons
B. Primer	61,759 Gallons
C. Felt	19,505,700 Square Feet
D. Fibre Glass Wrap	38,009,600 Square Feet
E. Kraft Paper	24,246,900 Square Feet
F. River Weights (All Sizes)	5,757
5. Number of Welds—Estimated	
Total Inches	14,407,092
Total Feet of X-Ray and Gamma Ray Film	276,000 (Approximately)
6. Number of Creek, Highway, and Railway Crossings	
A. Number of Creek Crossings	47 (Requiring Permits)
B. Number of Highway Crossings	282 State Highways
C. Number of Railway Crossings	62 Crossings
7. Laying Rates	
30-Inch Main Line, Hilly Region	0.80 Miles/Day/Spread
30-Inch Main Line, Flat Land	1.13 Miles/Day/Spread
Over All Main Line Total	0.97 Miles/Day/Spread
Lateral (Typical Spreads)	
20-Inch Pipe	.87 Miles/Day/Spread
24-Inch Pipe	1.12 Miles/Day/Spread
16-Inch in Swamp and Marsh Land	.41 Miles/Day/Spread
16-Inch Pipe on Dry Land	.55 Miles/Day/Spread (Small Spreads)
12-Inch Pipe in Swamp and Marsh Land	.66 Miles/Day/Spread (Small Spreads)
12-Inch Pipe on Dry Land	.98 Miles/Day/Spread
8. Total Number of Valve Settings in Main Line	
66—20-Inch Gate Valves	

ROCK WAS A BIG BARRIER in eastern Kentucky. But in spite of it, the contractor averaged more than 4000 feet of line per day.

Line location made the difference . . .

This is one of the most important phases of pipelining. It can spell the difference between high and low-cost construction; and there's more to it than simply drawing a straight line on a map.

"The shortest distance between two points is not necessarily the best place to run a pipe line," L. C. Cox, Jr., superintendent of pipe line construction for Gulf Interstate, explained emphatically. "Rock and water run the cost of laying pipe sky-high; and if you can avoid them by laying a few extra thousand feet of pipe, it'll pay off."

And, as the record-breaking progress attests, it did pay off.

The first step in line location was to select a broad general route for the line. It was based on the three salient points which generally govern the location of pipe lines running to the East:

- **Where will it start?**
- **Where will it end?**
- **Where will it cross the Mississippi River?**

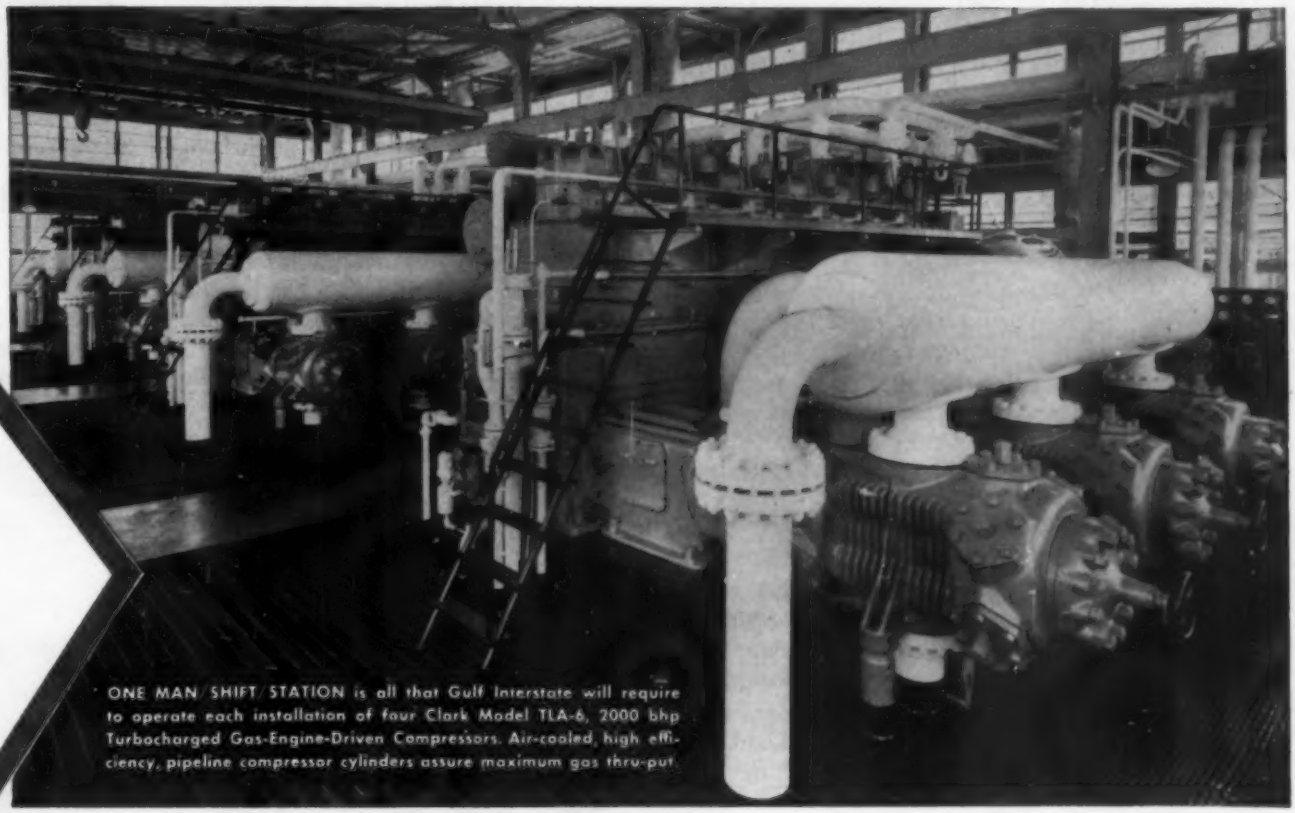
In this case, the first two points were fixed by supply and demand, and to select the third point, the company called in a firm of consultants, expert on the habits of the Mississippi. They studied the geology and general alignment of the river and, most important of all, its history, and picked a point for the crossing that offered maximum stability.

The next items of importance governing the location of the line were water, rock, and steep slopes. Experienced pipe liners studied geologic maps, highway maps, county maps, and aerial photographs. They selected a portion of the route, then drove it; flew it; and even walked part of it, never hesitating to change the location to provide the best right-of-way from the standpoint of construction and maintenance.

Here's the pattern for gas transmission pipeline compressor stations of the future!

NEW GULF INTERSTATE SYSTEM

Selects the Clark Turbocharged Model TLA-6 for its Automatic, Push-Button Operated Stations



ONE MAN SHIFT STATION is all that Gulf Interstate will require to operate each installation of four Clark Model TLA-6, 2000 bhp Turbocharged Gas-Engine-Driven Compressors. Air-cooled, high efficiency, pipeline compressor cylinders assure maximum gas thru-put.

It's already an accepted fact that the Gulf Interstate Gas Company has changed the pattern for natural gas transmission with its one man, push-button controlled, automatic compressor stations.

With such advanced thinking, it's only natural that Gulf Interstate will be the first to use the NEW Clark Model TLA, 2000 bhp, Turbocharged Compressors in conjunction with their newly developed system of controls.

Gulf Interstate's control devices for automatic operation of these Clark Compressors did not appreciably increase the installed cost.

If you're interested in a compressor station that can be operated with the highest possible efficiency — *automatically* — while still maintaining station-loading flexibility, be sure you investigate Clark Models TRA and TLA Compressors. There are 8 sizes in a range of 825-3300 bhp. Ask your nearest Clark representative for Bulletins 130 and 134.

CLARK BROS. CO. • OLEAN, N. Y.
ONE OF THE DRESSER INDUSTRIES
Sales Offices in Principal Cities Throughout the World

A dozen ways you'll be ahead with Clark TLA's

- 7000 btu/bhp/h fuel consumption.
- 40% less cooling required.
- 25-30% lower installation cost.
- Drastic reduction in number of moving parts.
- 90% engine mechanical efficiency.
- Detonation-free operation under all climatic conditions.
- Generous temporary overload capacity.
- Specifically designed for turbocharging.
- Low cycle temperatures for maximum cylinder and ring life.
- Only one turbocharger per unit.
- Unapproached for accessibility.
- 2-cycle simplicity, dependability.

CLARK compressors

Clark sets the pace in compressor progress

For more data on advertised products, use Readers' Service Cards, last page.

MAP OF GULF INTERSTATE SYSTEM

Surveying, engineering and purchase of the right-of-way . . .

Gulf Interstate expedited the procurement of right-of-way by establishing joint field offices for survey parties and land men. The two worked in close contact throughout construction of the project.

This close liaison between land men and engineers was one of the things that accounted for the speed with which the right-of-way was bought and surveyed. But there were other things, too.

Take, for instance, the problem that often crops up during preliminary surveys in the hills of eastern Kentucky. A survey party will run for miles through difficult terrain, only to find the preliminary line location crossed by a sheer rock bluff. The engineers must then retrace their steps, check with the home office, and re-locate the line.

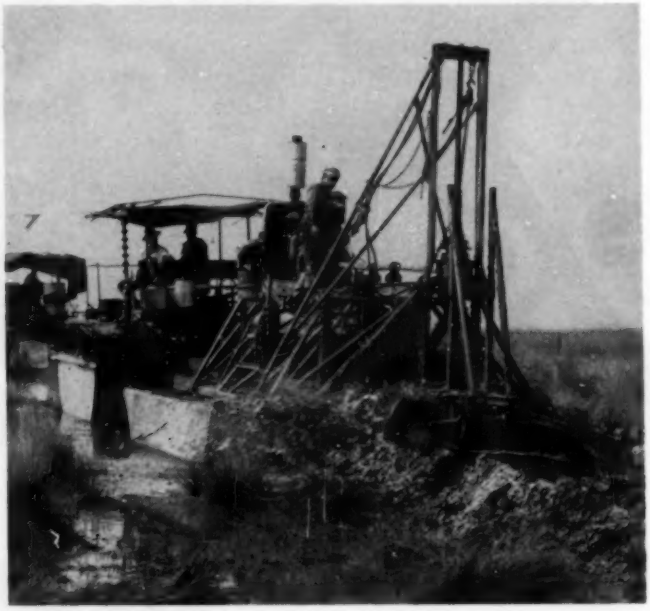
This is where a helicopter came in. In the hill country, they were used to scout ahead of preliminary survey parties. When the observer (always an experienced pipe liner) spotted cliffs and bluffs ahead, he flew back and dropped a sack of flour or chalk dust to re-direct the survey party.

Helicopters were used even more extensively in south Louisiana. As a matter of fact, they enabled survey parties to make more than four to eight times the normal speed through the marshes. Here's the way they did it:

Working on an aluminum platform, centered around an aluminum pipe which served as instrument point, the engineer took his back sight on the helicopter hovering over the preceding IP (instrument point) 8000 or so feet back. Then he flipped his transit, and using radio and visual signals, he lined up the helicopter on the foresight about 8000 feet ahead and established a new IP.

But even then the work of this man-carrying insect wasn't done. The helicopter flew back and picked up the aluminum platform and transported it through the air to the next IP and then carried the survey crew to the new location. Thus, the party was able to cover 8000 feet or so per shot instead of the usual 1000. For a portion of the surveys in this difficult terrain, the helicopter was even used to drag the chain.

HELICOPTERS WERE USED to speed surveying through marshlands of southern Louisiana. Helicopter served as backsite and foresite for the instrument man and then transported crew and tower shown here to new locations.



EGG BEATER DITCHING MACHINE made good progress through the marshes. Note that it casts the spoil near the ditch, facilitating backfill.

Construction of the line . . .

Although the farmers deplored it, last fall's drought that extended from the south-central part of the U. S., all the way across Kentucky was a blessing to the pipe line contractors on the Gulf Interstate project.

They were able to work months on end without shutting down for bad weather. One crew even worked 103 consecutive days. As a matter of fact, the work was so constant and the right-of-way so dusty, that the pipeliners themselves were soon wishing for rain just as ardently as the farmers.

With as many as seven spreads working at one time, construction progress charts in Gulf Interstate's home office jumped ahead about seven miles per day. By

December, only four months after construction had started, 650 miles of 30-inch main line was completed, as well as a large portion of the gathering system.

This rapid start more or less assured company officials that the tight schedule for starting operations could be met, and they ordered most of the construction shut down until spring. By so doing, they saved considerable money, since winter construction is costly and slow. Because of this progress, the remainder of the pipe line was constructed this year with fewer spreads engaged than during 1953.

The task of building the 30-inch main line fell to two contractors: Houston Contracting Company laid the section from Rayne, La., to near Hampshire, Tenn. For the most part, this was good terrain, and the over-all average construction progress ran 1.13 miles per spread per day.

H. C. Price Company laid the line on from Hampshire to its terminus near Catlettsburg, Ky. The terrain was difficult and rock was plentiful, yet the spreads averaged over 4200 feet of pipe per day.

Contracts for laying the gathering lines and laterals in south Louisiana were awarded to Associated Pipe Line Contractors, Inc., Anderson Brothers Corporation, and Williams Brothers Company.

J. Ray McDermott Company installed the four-line Mississippi River crossing (see June *World Oil*) and in so doing set a record by dredging 8.5 million cubic yards of earth. (The actual volume of the cuts ran about 4.3 million cubic yards, but the soil must be dredged in order to backfill the lines.) This company also installed the Ouachita and Red River crossings.

Missouri Dredging Company laid the Kentucky, Cumberland, and Tennessee River crossings. Williams Brothers Company crossed the Wax Lake outlet and Atchafalaya River.

Innovations. One of the most unusual features of the main line construction was the almost reverent care the pipe liners gave the tough ⅜-inch wall, 30-inch pipe. They were careful not to scratch or dent it; and they meticulously avoided getting dirt, rocks, or mud on the inside of the pipe. At the close of the day's work, they sealed the ends with water-proof "nightcaps."

Why this unusual care? For one thing, a slight external damage to a piece of pipe can cause stress concentrations just like the scratch on a piece of glass, and this very thing has been known to cause line failures.

There are two reasons for keeping pipe clean internally. The first is that pipe with water in it costs more to clean than a dry line. As a matter of fact, it takes three to five times as much gas or air to clean a wet section as it does to clean a dry one.

The second reason is that main line pipe was made from pickled skelp and has no mill scale. Engineers are hoping that this smoothness and absence of scale will give the system a slight added throughput because of the improved friction factor. But mud, dirt, and water cause corrosion—not serious enough to affect the strength of the pipe, but enough to possibly affect the friction factor.

Another innovation on this job was the use of pneumatic internal beveling machines to make the transition between pipe of different wall thickness. Ordinarily, when three-eighths-inch wall pipe is welded to ½-inch wall pipe, there is an internal ridge left in the line. The sharp angle where the two join can cause a stress concentration. To minimize this, designers have been calling for transition pieces to join the two sections. But these are expensive and sometimes take considerable time to install. With the new type internal beveling machines the transitions can be made right in the field.

Two other innovations were used in constructing the system. The first was an egg-beater ditching machine used in the swamps (see June *World Oil*). The second was a high-pressure water jet and compressed air ditching machine used to bury pipe in open water.

Cleaning and testing . . .

For the first time, compressed air was used to clean and test an entire big-inch pipe line system.

According to Gulf Interstate engineers, air offers several advantages over other methods of testing newly laid pipe lines. When hydrostatic testing is used, it leaves the line wet and hampers operations for months after the system goes in service. As compared with either hydrostatic or natural gas testing and cleaning, air is the least expensive of the three methods.

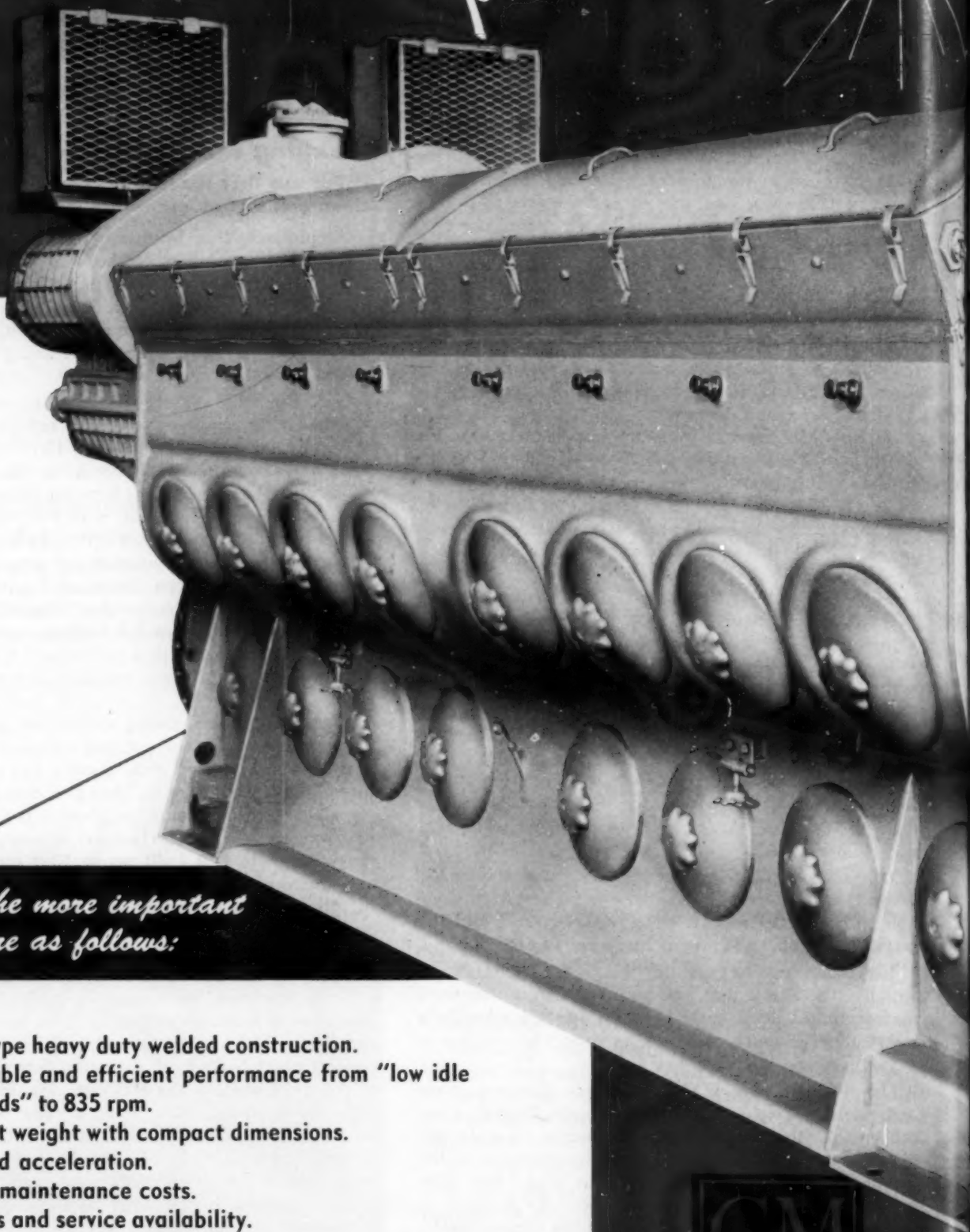
Gulf Interstate greatly reduced the cost of compressing the air for testing by using air from the tested sections to clean and test other sections. Here's the way crews worked the compressed air down the line. Calling three consecutive 12-mile sections between valve locations Sections A, B, and C, let's start with Section A undergoing the 24-hour 1050 pounds per square inch deadweight test (the company's maximum operating pressure will be 935 psi). Section B has been cleaned and is pressured to 200 psi after the test on Section A is completed. At the 200 psi pressure level Section B is walked for the detection of leaks in conjunction with a preliminary deadweight pressure test. The air is then equalized between Sections A and B.

Then compressors, taking suction on A start building up pressure in B for the test. But when pressure in A and B is equalized, about 2 million cubic feet of air is turned into C to pig and clean it. Then C is closed off and more air is bled from B to raise the pressure in C to 200 psi for line walking and the preliminary deadweight test. Next the pressure in B is built up to 1050 for the final test and the work proceeds on down the line. Of course a slightly different procedure was used to start the testing operation, since there were no pressured sections initially. After the sections had been cleaned and tested they were left with a positive pressure of 150 psi.

To do this work, the company organized and equipped two crews that not only made the tests but also set valves and drips. Each crew was equipped with nine air compressors which had a total of about 800 horsepower. Three of the units were in the 600 cfm class for low-pressure high-volume duty; three were regular 400 cfm compressors with 3¼ by 5½-inch liners; three similar compressors had 1 15/16 by 5½-inch liners for high-pressure work. All of the compressors were manifolded so they could be worked in series or in parallel depending on the over-all compression ratio.

Twenty men were in each crew, and they had, in addition to the compressors, two permeable plastic air scrubbers (see January, 1952, *World Oil*), a heavy tractor, trucks, power wagons, and welding and beveling equipment. Radio was utilized during all of these operations.

STEWART & STEVENSON presents the NEW

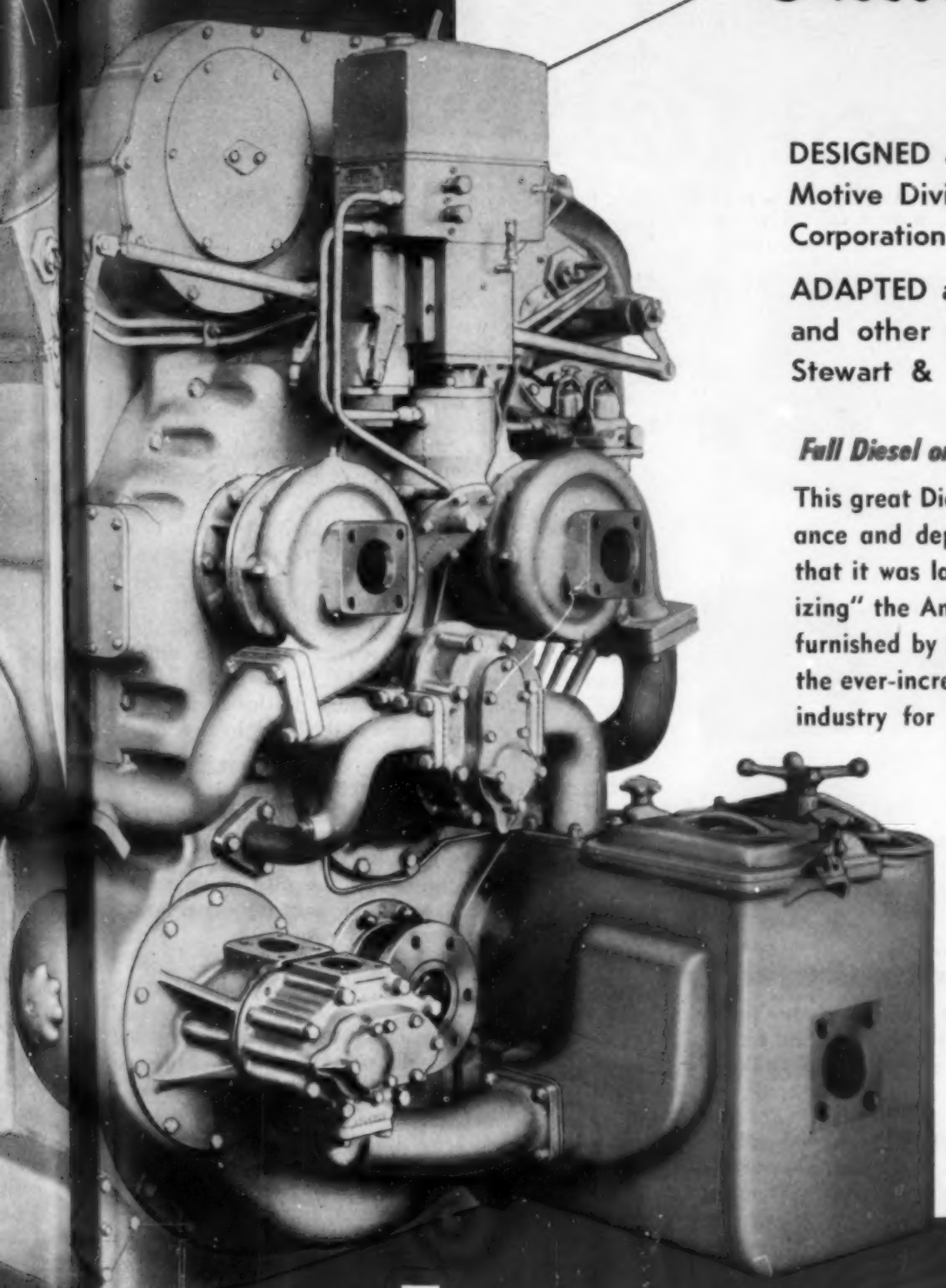


Some of the more important features are as follows:

V-Type heavy duty welded construction.
Flexible and efficient performance from "low idle speeds" to 835 rpm.
Light weight with compact dimensions.
Rapid acceleration.
Low maintenance costs.
Parts and service availability.

GM
DIESEL
POWER

MODEL 567-C General Motors Diesel Engine



DESIGNED and built by the Electro-Motive Division of General Motors Corporation.

ADAPTED and applied for oil field and other specialized service by Stewart & Stevenson Services, Inc.

Full Diesel or Dual Fuel - 600 to 1750 HP

This great Diesel with a record of performance and dependability, so outstanding that it was largely responsible for "dieselizing" the American railroads, can now be furnished by Stewart & Stevenson to meet the ever-increasing demands of the drilling industry for more flexible, higher horsepower with maximum fuel economy and long life.

Contact Stewart & Stevenson Today

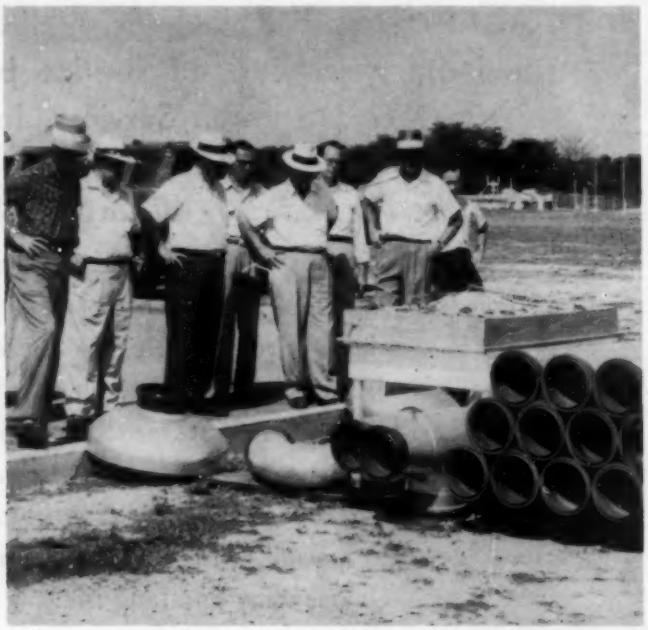
for complete information as to how you may utilize this dependable and low cost power plant for your particular application.

STEWART & STEVENSON SERVICES, INC.

Main Office and Plant — 4516 Harrisburg Blvd., Houston 11, Texas. Phone WOodcrest 3091.
Branches — Corpus Christi, Dallas, Lubbock, Wichita Falls, San Juan, Odessa.
Representatives — San Antonio, Longview, Brownsville.
Distributors of: — General Motors Diesel Engines, Climax Blue Streak Engines, Chrysler Industrial and Marine Engines, Petter Diesel Engines.
Fabricators of: — Electric Power Units, Electrical Control Equipment, Portable Pumping Units, Truck Bodies, Red Head Pumps.

STEWART & STEVENSON SERVICES

EACH PIECE OF EMERGENCY REPAIR KIT can be carried by two men. This permits repairs in areas difficult to reach with heavy equipment.



VISITORS EXAMINE REPAIR KIT at dedication of Gulf Interstate's Delhi station. Because it eliminates need for expensive and heavy maintenance equipment, this kit is of high interest to pipeliners everywhere.

Emergency pipe line repair kit . . .

It is to be used in case of blowout. Every piece of the kit can be carried by two men; it can be installed in a few hours to put the line back in operation.

Suppose Gulf Interstate's 30-inch line were to blow out in a remote swamp, during the rainy season when roads are virtually impassible. It might take days—even weeks—to assemble heavy equipment and reach the spot to effect repairs. Meanwhile, having only one line, gas deliveries would have to be curtailed.

While this will likely never occur, it could happen. And for this reason, the company's engineers devised the emergency repair kit shown here.

Just suppose the blowout described above *did* occur. Assume that it was possible to get no closer than 1000 feet from the spot with mobile equipment. Here is the way this situation would be handled in the field.

- *First,* the pipe line crews would immediately close the main line valves on either side of the affected section and proceed to the location of the break.
- *Second,* they would move the emergency repair kit as close to the blowout as possible by truck; then carry it the rest of the way on foot.
- *Third,* they would build a coffer dam around two points—above and below the break—and pump the bell-hole dry.
- *Fourth,* they would remove the damaged pipe and bevel the open ends.
- *Fifth,* they would weld on the special weld caps shown at the left, using long leads and a welding machine on the truck 1000 feet away.
- *Sixth,* they would connect a manifold to each of the weld caps, these in turn being connected by three eight-inch lines. All repair kit connections consist of a quick-type coupling. The couplings on the pipe and swing joints have "O"-ring seals that set when pressure hits them.

This kit can be left in service until such time as permanent repairs can be made.

One of the important advantages to this kit is that all necessary parts can be carried to the break by two men.

Streamlined personnel organization . . .

The credit for the swift speed with which the new system took shape is generally given to the streamlined organization of company personnel and the good weather of last year.

While the weather is a matter of luck, the organizational setup is not.

A glance at the company's organization chart reveals that many of the intermediate positions usually found on a transmission company's roster have been eliminated.

When the system goes in operation it will have only 200 men in the field and a main office staff of 125. For organizational purposes, the Gulf Interstate system is divided into five districts—one covering the gathering system and four on the main line. A district superintendent is in charge of all operations within each district, aided by several assistants. Each district consists of between 170 and 330 miles of pipe line depending on the geography and location of compressor stations.

Of the 200 men in field operations, 19 are in supervisory capacity; there are four operators at each compressor station, making a total of 20 operators for the system; and 175 men in the category of foremen, welders, mechanics, truck drivers, utility repairmen, clerks, and laborers.

DELHI (LOUISIANA) COMPRESSOR STATION in final stages of completion. This station is controlled automatically and can be operated by only one man on duty. Structure at right is the annex.

GULF INTERSTATE *continued*

Here are the highlights of station design . . .

The stations are push-button controlled and require only one operator on duty. Moreover, they were designed for minimum fuel consumption.

Gulf Interstate engineers were not hampered by traditions and conventions in designing the company's five compressor stations. At the outset, they resolved to take a new look at existing stations and to freely jettison old ways of doing things if need be in order to improve station operation and efficiency.

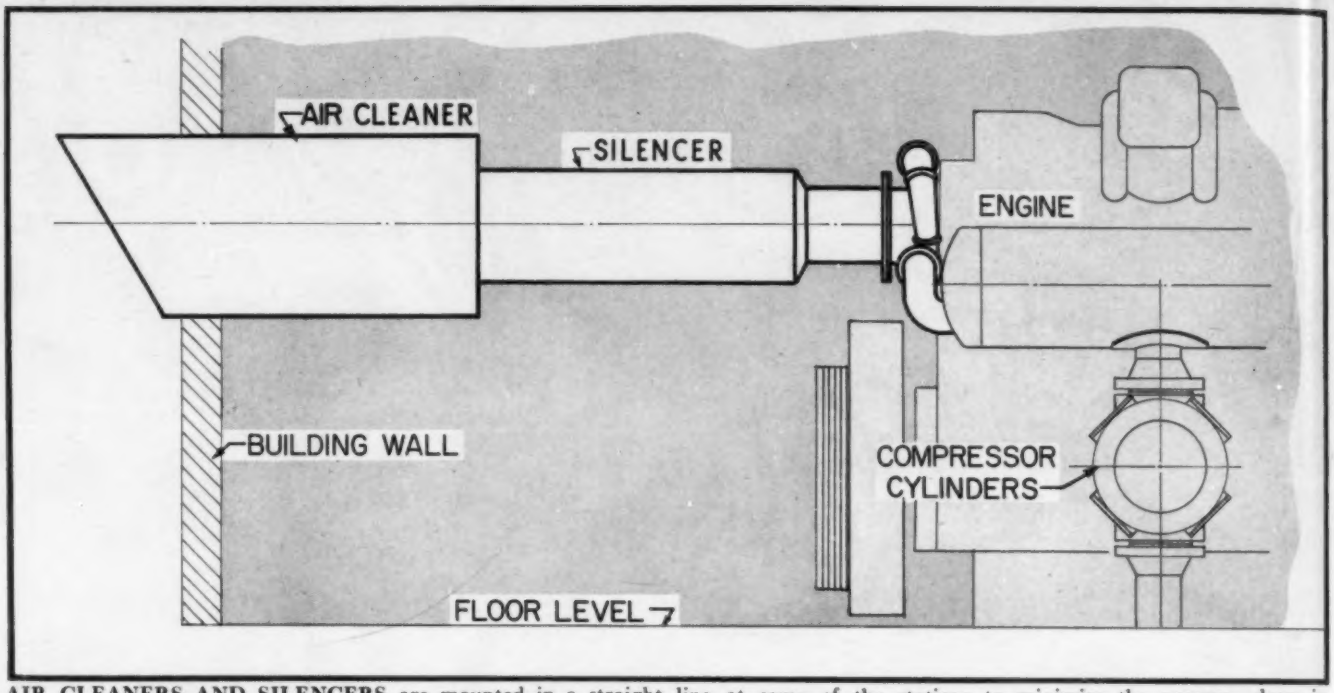
On the whole, the gas industry has had a tendency to repeat existing station designs. Most of today's engineering drawings are more or less identical with those of last year's. The reason for this is that more often than not, new station horsepower is added to an existing station—or at least to an existing system—and sometimes the trouble and confusion caused by a change will exceed its benefits. But with a new system, Gulf Interstate management felt that the company should take every advantage of the many recent engineering and scientific advances to improve the stations. They advanced five primary considerations which served as criteria for design engineers. These were:

- **How to make the stations more thermally efficient.**
- **How to make them more functional.**
- **How to make them easier and cheaper to operate.**
- **How to make them safer.**
- **How to make them easier to maintain.**

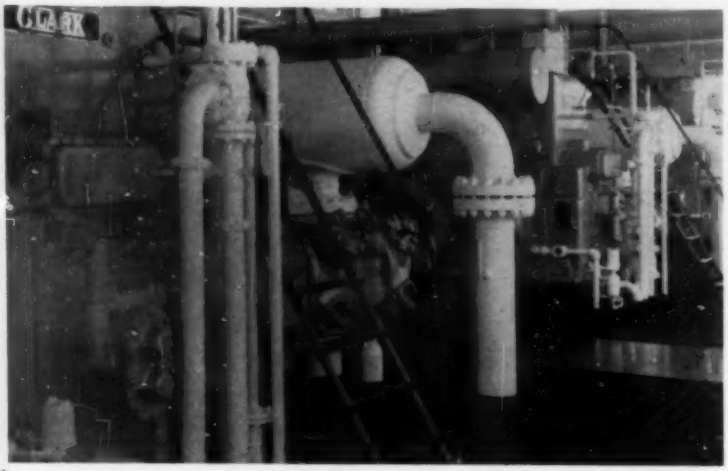
Thermal efficiency. Because of the vast power requirements involved in the transmission of large quantities of natural gas through a cross-country pipe line, thermal efficiency has to be one of the first considerations of the design engineer. The field price of natural gas has advanced in recent years, and today fuel gas has become a major expense item in pipe line operations.

Another reason thermal efficiency is so important is that the transmission company's primary function is to move gas to market. Any unnecessary fuel gas used by the stations cuts into the line's capacity as a carrier. Besides, it represents a double loss to the company; the price paid for the gas in the field and the cost of moving it down the line to the compressor station.

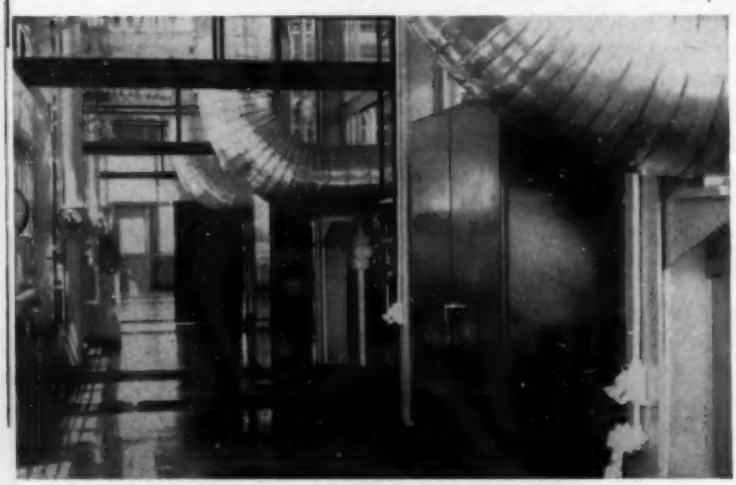
How thermal efficiency was increased. The formula for improving station thermal efficiency is basically simple



AIR CLEANERS AND SILENCERS are mounted in a straight line at some of the stations to minimize the pressure drop in the intake air system.



DELHI COMPRESSOR BUILDING. Engines are supercharged by exhaust-driven turbines and because of the high thermal efficiency, the entire station consumes only eight cubic feet of gas per bhp/hour.

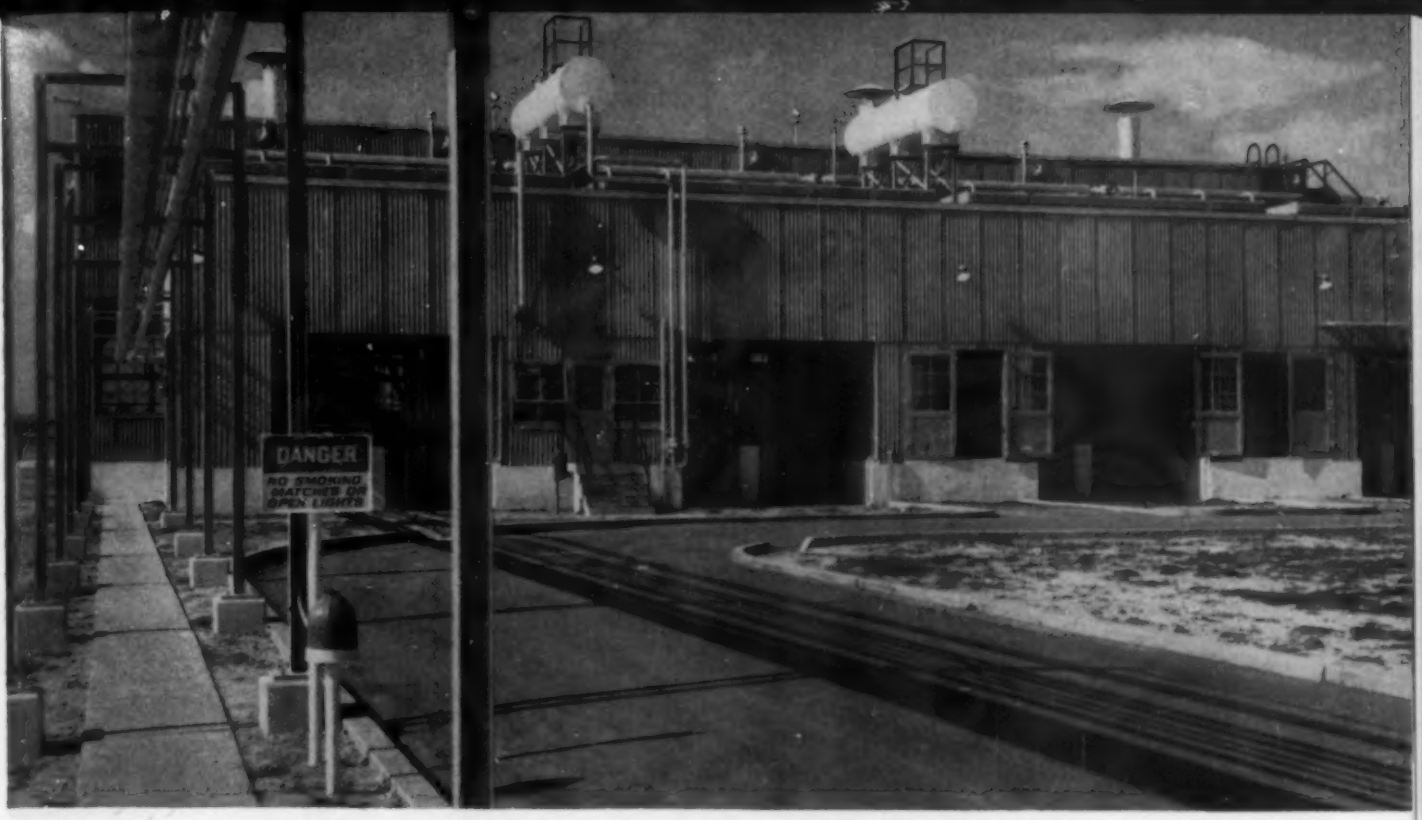


OPPOSITE END OF ENGINE in compressor building shows exhaust piping from turbine.

—install the most efficient engines and compressors available and then design the station around them so that the engines have the most efficient operating conditions possible. This means that auxiliary power—whether in the form of electrical power purchased or generated at the station or power taken directly from the engine crankshaft—should be at a minimum when the engine is running, and drop to zero when the engine is idle. And during operation, the intake air and exhaust system pressure drops that rob engines of efficiency should be as low as practical.

Following this general formula, Gulf Interstate designers first selected two makes of 2000 horsepower reciprocating engines which seemed to offer the maximum thermal efficiency. Both engines can operate at full load on about seven cubic feet of gas per brake horsepower hour and at the same time supply their own auxiliary power. The oil and water pumps are integrally mounted on the engine as is the impulse-type generator that furnishes ignition power. To make the engines wholly unitized, it was only necessary to power the fans on the atmospheric coolers from the engine. This was accomplished by running a drive shaft from the engine to the cooling fan outside the building. As a further refinement along the lines of thermal efficiency, the power from the shaft is transmitted through a fluid coupling which is instrument controlled so that the power taken from the crankshaft does not exceed the amount needed to turn the fan at proper speed for cooling.

An additional increase in thermal efficiency was effected by simplifying the intake-air piping. By designing it as large as practical and eleminating unnecessary turns, the horsepower required to compress scavenging air was decreased. At those stations where the engine arrangement made it possible, the intake air cleaner and silencer



ANNEX CONTAINS ATMOSPHERIC COOLERS and the three rooms between them are occupied by starting air compressors, water treating equipment, and fuel gas metering.

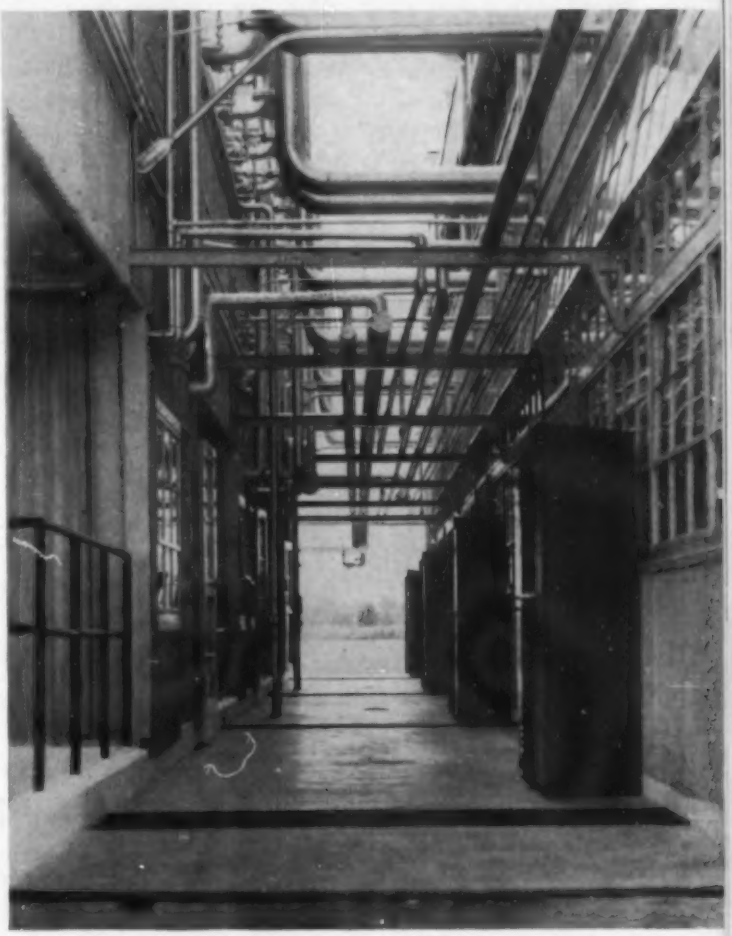
were mounted in a straight horizontal line to the engine. This measure has materially increased efficiency.

The exhaust piping was simplified and sized to exert minimum back-pressure on the engine. Factory tests made on the engines prior to delivery proved that both scavenging-air and exhaust piping were critical so far as achieving the desired thermal efficiency was concerned. Since one of the makes of engines used on the system utilizes the heat in the exhaust gas to power a centrifugal scavenging air blower, it requires no silencer, and the exhaust piping runs straight to atmosphere.

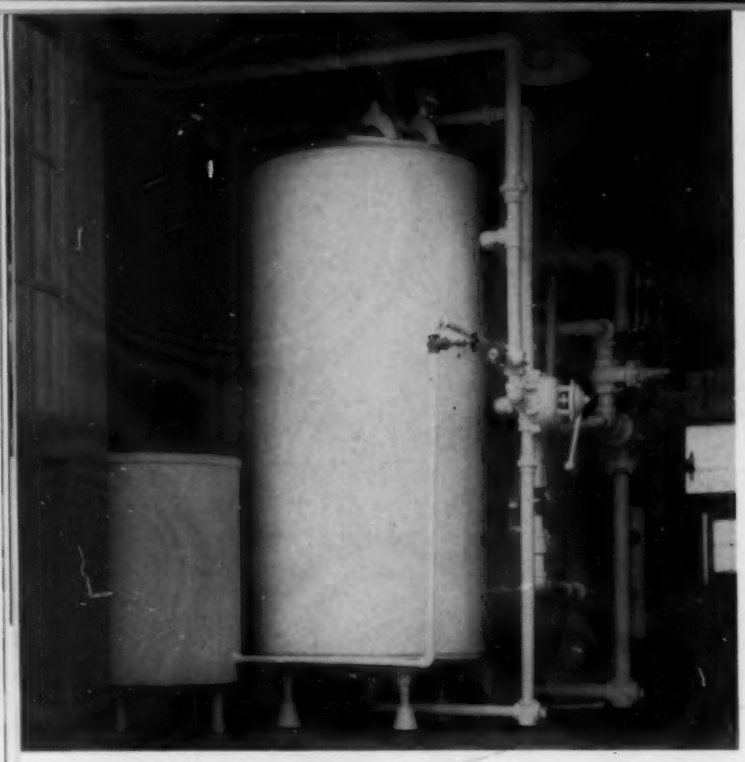
With each engine furnishing its own auxiliary power, the major electrical load at the station is that of lighting. For this reason, it was necessary to install only small generators at the stations.

Functional design. For a station to be totally functional in design, every nut, bolt, and screw must in some way contribute to the station operations. While it is doubtful that any station was ever absolutely functional, there are many features in conventional stations that contribute little to operations. An outstanding example of this is the basement in most compressor buildings. It serves little purpose in station operations. The engine service piping that is usually found in the basement could better run overhead in the compressor building. Moreover, in case of high pressure gas leaks, the basement becomes a large accumulator for explosive gas mixtures. But the biggest disadvantage of all is that to provide headroom in the basement, the engine foundation blocks must be designed to have a tall rectangular cross-section rather than the optimum low rectangular cross-section.

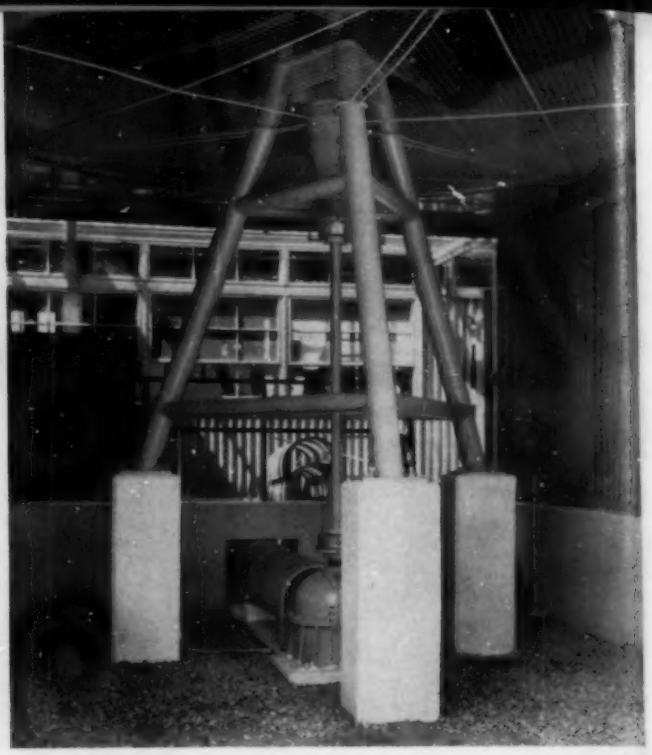
For these reasons, the basement was eliminated by Gulf Interstate, and the engine blocks were designed to



SPACE BETWEEN COMPRESSOR BUILDING at right and annex at left is occupied by piping. Cabinets at right house electrical controls for engines.



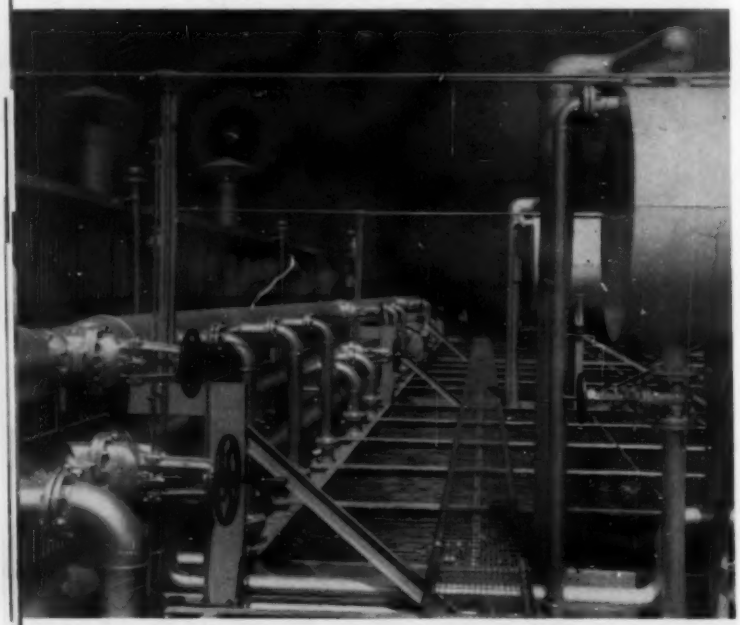
SPACE BETWEEN ATMOSPHERIC COOLING FAN in annex contains such auxiliaries as water-treating equipment, air compressors, and lube oil-treating equipment.



SHAFT-DRIVEN ATMOSPHERIC COOLING FAN in annex. Shaft has hydraulic coupling that controls fan speed according to cooling needs.

extend only 3½ feet above the top of the mat. The high pressure gas piping and part of the oil and cooling water piping run in pits between the blocks under the operating floor.

Another move in the direction of functional design was the utilization of the space between the atmospheric coolers to house starting air compressors, a fuel gas meter run, and water treating equipment. Usually these three services are housed in other buildings, requiring unnecessary steps for the operator. Bringing them right next to the compressor building not only makes the station more operable, but also saved a certain amount of piping.



ON TOP OF ANNEX is cooling water piping and surge tanks. The stacks at left are engine exhausts. No silencers are needed at this particular station because the exhaust gas passes through the supercharging turbines on compressor engines.

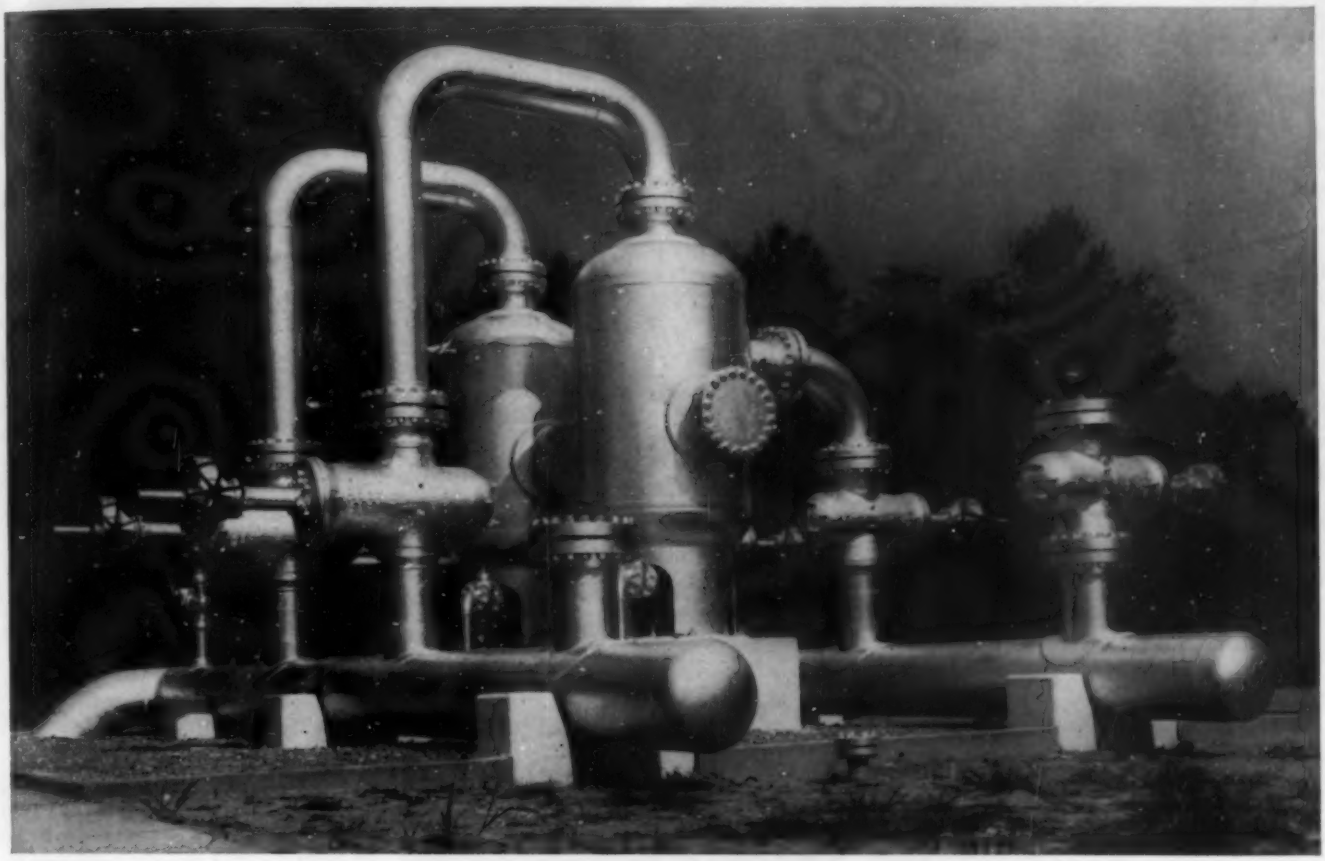
Low-cost operation. During the past few years, a number of economic studies have been published showing the advantages of using the gas-fired turbine as a compressor station prime mover rather than the recriprocating engine. While the studies admit that the turbine has higher fuel consumption than the reciprocating engine, they point out that a turbine-equipped station requires fewer operating personnel. In fact, the economic advantages of the turbine hinge on the latter.

But let's take a closer look. Why does the turbine station require fewer operating personnel? Mainly, the answer lies in the field of automatic controls. The turbine start-up is effected through sequential control devices; suction and discharge valves are automatically controlled and the turbine has a myriad of malfunction shutdown devices. The instrumentation is so extensive that the stations could—except for routine maintenance—be operated remotely. In other words, the primary advantage of a station equipped with gas-fired turbines having a higher fuel consumption than a reciprocating station is automatic controls.

Why not apply the same controls to the highly efficient reciprocating stations? The same general tasks that instruments must perform at the turbine station must also be performed at the reciprocating station: starting power must be applied to the engine; ignition must be switched on; fuel gas valve must be opened; then, at the proper time, the engine must be loaded.

As it turned out, on Gulf Interstate's system, the instrument hookup for a reciprocating station is not as complex as that of a turbine station. Using instruments that are readily available on the market, designers were able to effect semi-automatic or "push-button" operation to such an extent that the entire station can be easily operated with only one man per shift.

Two design 2V-54-172 Aerotec gas cleaners at The Delhi, La. compressor station of Gulf Interstate Gas Company. Each unit provides a capacity of 200,000,000 SCFD at a working pressure of 650 psig. Units have a maximum design pressure of 1000 lbs. and a pressure drop of 1.5 lbs.



GULF INTERSTATE GAS COMPANY *chose*

AEROTEC GAS SCRUBBERS

for the five compressor stations on its new 1150 mile pipeline system

A prerequisite of semi-automatic control is the selection of equipment proven by experience to require the least maintenance. No more logical component could be chosen than the Aerotec Gas Scrubber, the world's only centrifugal type dry scrubber.

Cleaning gas the Aerotec way eliminates carry-over of conventional type cleaning liquids . . . Aerotec uses no liquids. It assures freedom from overloading . . . Aerotec efficiency improves at higher loads; and it means predictable efficiency (we will analyze your own pipeline dust to make this prediction).

Many nationally-known gas producing, transmitting and distributing companies now specify Aerotec Gas Scrubbers for their compressor installations. They are smaller, lighter and more dependable than conventional types.

Why not contact Thermix, our Project Engineers, for full information.

Project Engineers: **THE THERMIX CORPORATION** **Greenwich, Conn.**

(offices in 38 principal cities)

Canadian Affiliates: **T. C. CHOWN, LTD. Montreal 25, Quebec**

Manufacturers:

THE AEROTEC CORPORATION

GREENWICH, CONN.

For more data on advertised products, use Readers' Service Cards, last page.

Let's get technical about WALWORTH LUBRICATED PLUG VALVES for pipeline service

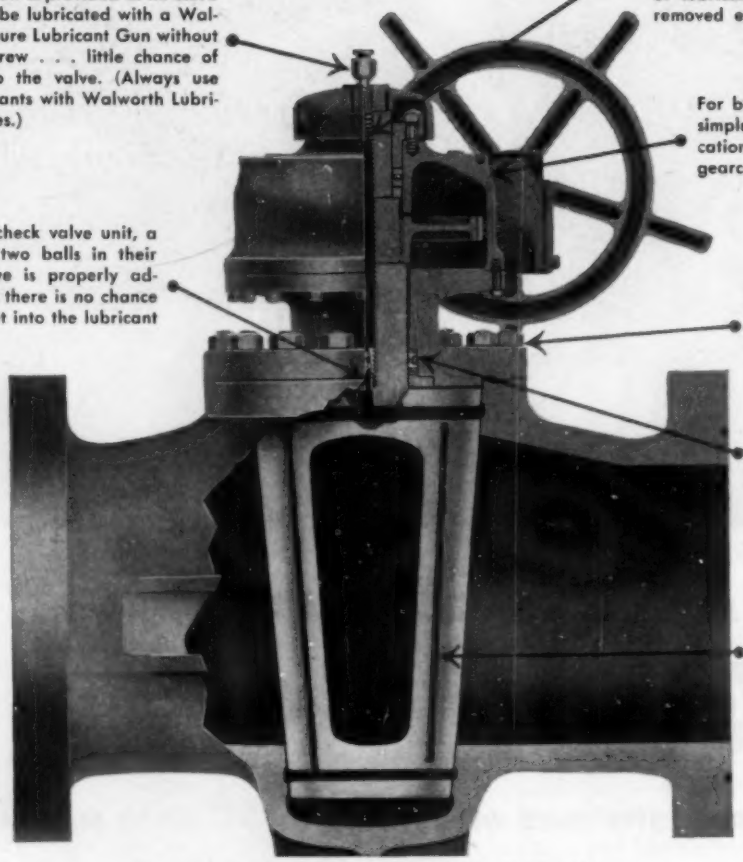
Combination button-head lubricant fitting and lubricant screw is provided at no extra cost. Valves can be lubricated with a Walworth High Pressure Lubricant Gun without removing the screw . . . little chance of grit getting into the valve. (Always use Walworth Lubricants with Walworth Lubricated Plug Valves.)

An added safety feature in the form of a groove cut part way up side of the lubricant-fitting screw allows the operator to observe any tendency of lubricant to blow out *before* the screw is removed entirely.

For buried pipelines — yoke design permits simple attachment of handwheel and lubrication extensions without modifying the gearcase.

In the stainless steel check valve unit, a transverse pin holds two balls in their seats. When the valve is properly adjusted and lubricated, there is no chance for line pressure to get into the lubricant system.

Standard bolt threads, rather than fine threads, mean easy replacement of nuts and bolts from local stocks.



Two overlapping Teflon packing rings form an effective seal against possible leakage without "grabbing" the plug shank. Low breakout torque . . . plug turns easier. Packing serves only as a seal and is not used to hold the plug in its seat.

Lubricant grooves completely frame the port openings and encircle the plug at the top and bottom assuring a tight seal against leaks. Bottom circumferential groove is separate from, but connected with, the lubricant well.

Other Walworth Lubricated Plug Valves include Single Gland and Regular Gland types. Sizes to 30 inches. Pressures to 5000 psi. and for vacuum service.

Cutaway of a 24-inch Walworth Lubricated Plug Valve

Without exception, a Walworth Ball Bearing Lubricated Plug Valve is easier to operate and maintain than any other type of rotary-action, sealed valve available today for pipeline service. Design features pointed out here show just a few advantages of Walworth Ball Bearing Lubricated Plug Valves.

Many pipeline companies throughout the world use Walworth valves for handling gas, crude, and finished products. Investigate the line of Walworth valves for your own needs. See your Walworth Distributor, or write for literature: Walworth Company, General Offices, 60 East 42nd Street, New York 17, N. Y.

Use pigs or scrapers?

Walworth Type 49 Cast Steel Gate Valves are designed on the throughport principle to permit passage of pigs and scrapers — may be installed without regard to flow direction. Sizes 2 to 30 inches inclusive. Ask for literature.

DISTRIBUTORS IN PRINCIPAL

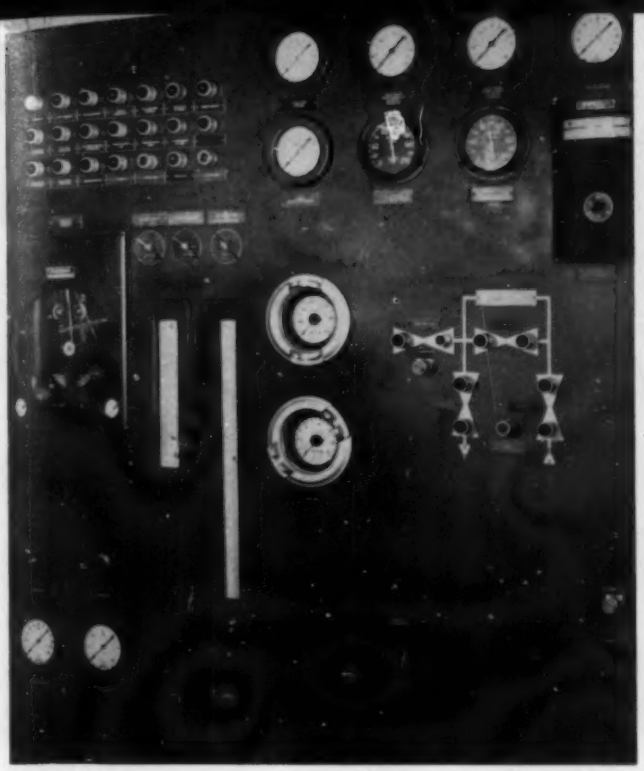
WALWORTH

Manufacturers since 1842

valves . . . pipe fittings . . . pipe wrenches

60 East 42nd Street, New York 17, N. Y.

SERVING THROUGHOUT THE WORLD



CONTROL PANEL for one of compressor engines. Starting equipment is at lower right with valve operators above. At upper left is an annunciator panel that warns of trouble.

ELECTRICALLY-OPERATED VALVES on the suction and discharge lines.

Push-button operation. Physically, all the operator at one of Gulf Interstate's compressor stations has to do to put an engine on the line is to turn a switch and push two buttons on the individual engine control panel. When he turns the switch to "automatic control" the high-pressure gas valves position themselves for engine start-up. While the engine was idle, the suction and discharge valves were closed and the bypass valve was open. When the switch is turned prior to start-up, the discharge valve opens and the other valves remain in their respective positions.

Next, the operator activates a starting air valve and compressed air starts the engine rolling. As the engine picks up speed, it builds scavenging air pressure. When it reaches a predetermined pressure it actuates the ignition switch. This delay in switching on the ignition gives the scavenging air time to purge the engine of any fuel gas that might have leaked into it, thereby preventing a possible explosion.

After the ignition has been on for a certain time, the fuel gas valve opens and the engine starts running under its own power. When the engine has had sufficient time to come up to operating temperatures, the operator presses a "load" button. This causes the suction valve to start opening, and after a short delay, the by-pass valve to start closing. Instrument interlocks prevent the bypass from starting to close until after the suction valve has started to open.

Once the engine is in operation, there are a number of control devices that monitor its operation. They warn the operator of approaching trouble and actually shut the engine down in case any of the following conditions occur:

- Excessive vibration
- Low lube oil pressure
- High discharge pressure
- High jacket water temperature

The annunciator panel warns of other troubles. For instance, there are low exhaust temperature warning lights and audible signals, and the panel has a scanning pyrometer which warns of any approaching high power cylinder temperatures.

When the operator throws the switch to "Off" position, the fuel gas valve closes, but ignition continues until low-pressure oil or low-pressure scavenging air gives the signal for shut-off. Then the suction and discharge valves close and the bypass opens.

Starting and stopping the engines are not the only functions controlled by instruments in the new stations. For instance, during engine start-up, an instrument actuated three-way valve directs cooling water through the scavenging air coolers and allows the water in the engine jacket and oil cooler to re-circulate. As cooling for the latter is required, the valve directs a portion of the cooling water through the atmospheric coolers. When additional cooling is required, the thermostatically-controlled hydraulic coupling starts the fan turning.

Temperature of the lube oil is controlled by a somewhat similar instrument hookup. The heat exchanger is by-passed until the operating temperature has been reached; then, as cooling is required, the three-way valve directs the oil through the cooler.

Safety measures. Every effort was made to insure the safety of the operating personnel and equipment. From the design standpoint, the first step along this line was to study the primary sources of safety hazards.

Obviously, the most serious hazard is high-pressure gas; foremost consideration was given to minimizing its undesirable effects. The first step was to eliminate all high-pressure gas instrument lines from the compressor building. The reason for this is that small-diameter lines have low structural strength, even though they are capable of withstanding greater pressures than the heavy-wall, large-diameter lines. In addition, the use of small-diameter

scintillation counters for the oil industry

Tracerlab has a complete line of scintillation counters useful for solid and liquid sample assay, low level beta counting, aerial and ground surveying and many other applications. In addition, we supply packaged and unpackaged stilbene, NaI(T1) and ZnS crystals, plastic phosphors, and a wide range of liquid phosphors.

Please request Catalog DW, for complete specifications and prices.

Tracerlab® inc.

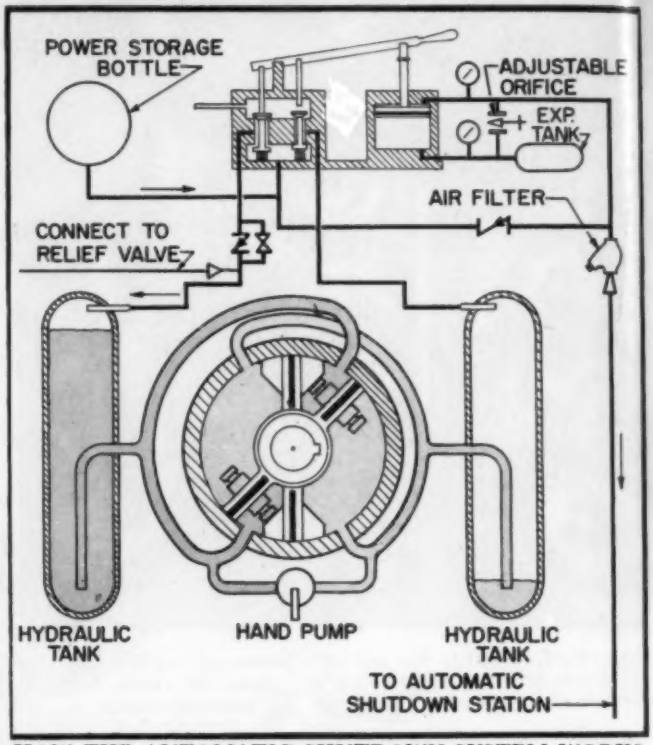
P-20 Scintillation Detector for solid sample assay.

P-20 Scintillation Detector for liquid sample assay.

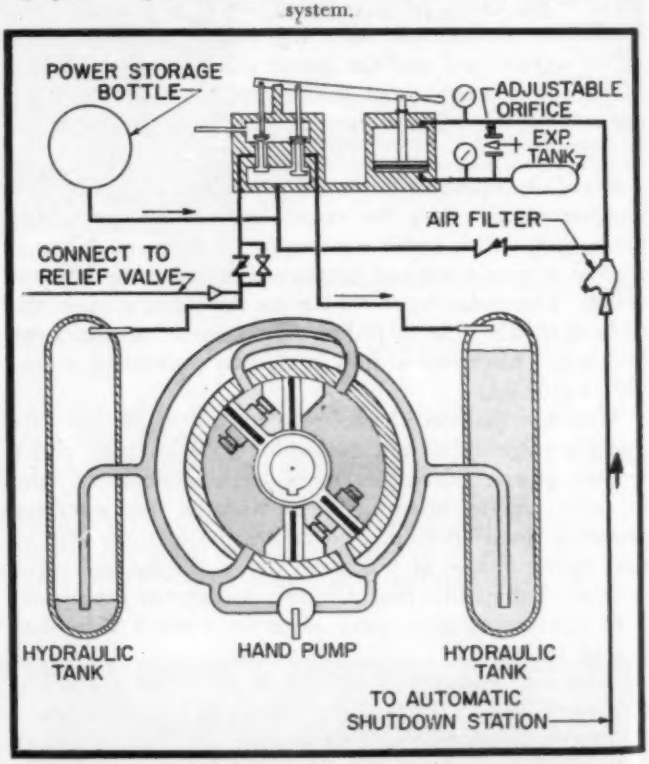
P-12 Alpha Scintillation Detector.

130 HIGH STREET, BOSTON 10, MASS.
2030 WRIGHT AVE., RICHMOND 3, CALIF.

GULF INTERSTATE ***continued***



HOW THE AUTOMATIC SHUTDOWN SYSTEM WORKS. In case of trouble, line at the right is exhausted by opening a valve at any one of the shutdown stations. This elevates the piston at the upper right, depressing and opening the valve in the left-hand chamber. This permits air from the power storage bottle at the upper left to enter the hydraulic chamber at the lower left. This forces the valve to turn 90°, closing off the high-pressure gas. A connection to relief valve blows down the system.

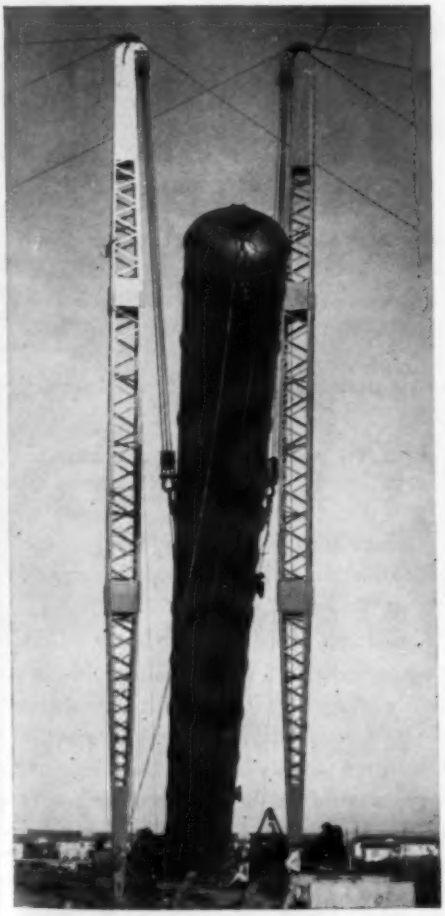


TO REOPEN THE MAIN LINE VALVES, the automatic shutdown system is closed. Air from the storage bottles pressures the power system, and when the lever at the upper right is depressed, the right-hand valve in the chamber at the left is opened and supply air enters the top of the hydraulic chamber at the right. This forces the valve back to its original open position. The hand pump on the valve can manually open or close the valve in two minutes.

Multiple-part Red-Strand Slings are always trusted to handle heavy loads. They are easy to apply to both the load and the crane hook. User tests in Detroit proved Red-Strand slings withstood unusual abuse, yet maintained higher-than-rated strength.

A Gary plant uses Red-Strand single-part slings for many lifting jobs like this. These slings are available with various combinations of end fittings for attaching the sling to rings or lugs. Single-part slings frequently are the most economical to use.

How to Select the Correct Sling for Your Job



A heavy cylindrical load like this usually calls for the use of multiple-part Red-Strand Flat-Laced slings. They are strong, flexible and do not slip or abrade on smooth round surfaces.

Start your sling selection by analyzing five factors:

1. The load—its size, weight, shape, finish.
2. Working area, amount of head room.
3. Size and type of crane hook.
4. Angle of sling legs.
5. Location and type of lugs or rings, if any.

This is basic information. From it, your supplier can recommend the sling by type, size and length that is safest, longest lasting and most economical for your job.

Types of Slings

Multiple-part slings are always recommended for heavy duty service, because for equal strength they are far more flexible than single-part slings. They hug the shape of the load easily, present a greater bearing surface to the load, and reduce the possibility of marring finely finished surfaces.

Where these factors are not so important, either Red-Strand ***single-part slings*** or ***grommet slings*** may be used for economy. Single-part Red-Strand slings are often recommended for lifting lighter weight objects, or those that have fixed attaching rings or lugs. Grommet, or continuous strand Red-Strand slings are ideal for forming hitches of various types without fittings.

How to Gain Extra Savings

Re-useable Pin-Lock thimbles reduce sling costs by 21%

Two suggestions will help you save money on slings.

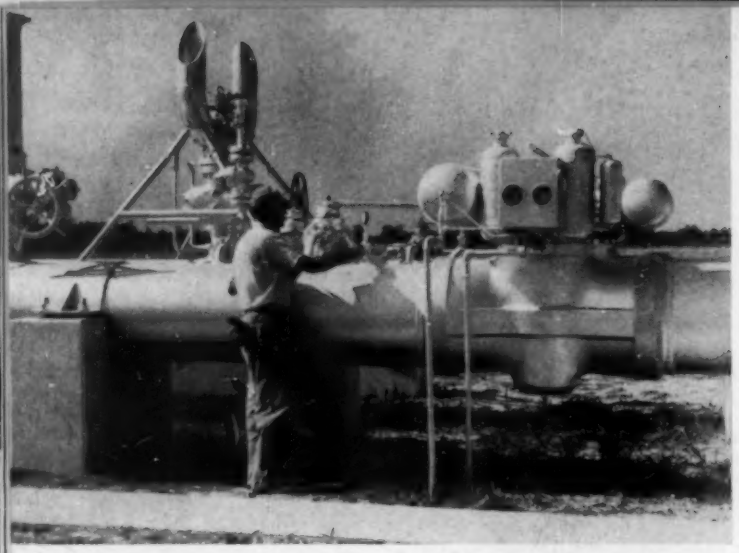
The first is to re-use Pin-Lock thimbles on multiple part slings. They increase sling life by protecting loops from abuse or damage. Besides, these exclusive Leschen Pin-Lock thimbles cut sling costs on an average of 21% because they may be used again and again. They lock into sling loops with pins instead of permanent clamps, permitting re-use, and eliminating constant expense of thimble replacements.

The second suggestion is to use Red-Strand slings—for a very simple but good reason: Red-Strand slings are made of ***higher-than-rated*** quality Leschen wire rope that delivers ***longer-than-expected*** service.

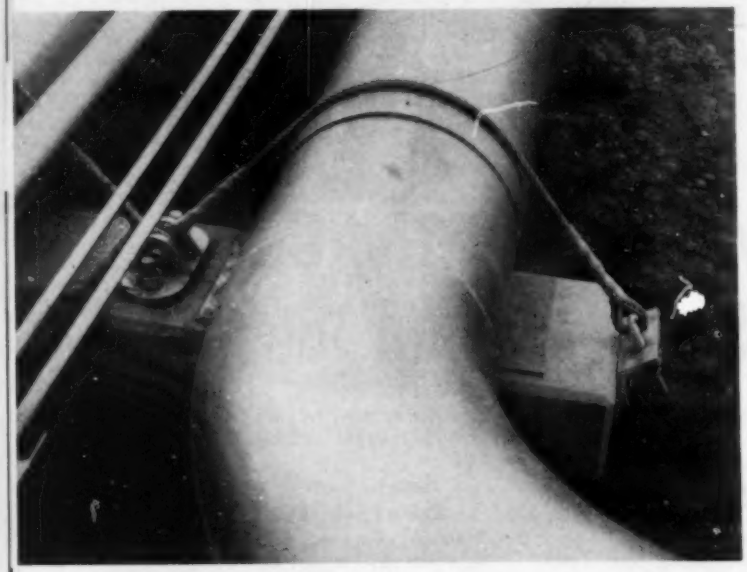
Get a copy of Leschen's ***Sling Handbook*** for complete information. Ask your Leschen man for one, or write.

LESCHEN WIRE ROPE DIVISION
The Watson-Stillman Company
(A SUBSIDIARY OF H. K. PORTER COMPANY, INC.)
St. Louis 12, Missouri

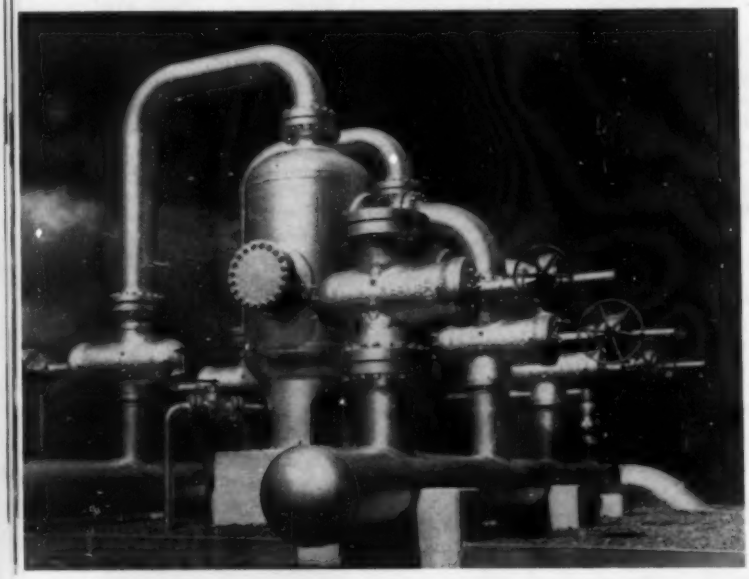
LESCHEN
HERCULES Red-Strand
WIRE ROPE



AUTOMATIC SHUTDOWN SYSTEM showing one of the station block valves. The valve will close in approximately 30 seconds if any of the emergency shutdown valves spotted at safe points around compressor station are vented to atmosphere.



EVIDENCE OF EFFICIENCY of pulsation dampeners is the wire rope pipe clamp on discharge header.



DRY-TYPE SCRUBBERS are used at the Delhi compressor station.

gauge lines inside the compressor building was kept to a minimum.

Another source of danger to the station is the possible failure of the high-pressure suction and discharge piping. The No. 1 cause of such failures has been fatigue, which in most cases was induced by pulsation.

Gulf Interstate engineers, using well-known principles that were developed years ago, designed a low-pass acoustic-type pulsation dampener. Careful sizing and designing of these dampeners resulted in the elimination of most of the undesirable pulsations that could contribute to fatigue.

Like most compressor stations designed in recent years, those built by Gulf Interstate have a remote controlled shutdown system which can be operated from several positions in case of fire or explosion. When actuated, the controls can shut down the main engines, close the station side gates and blow down all of the gas piping on the station side of the gates. The entire time required to perform these functions is approximately 90 seconds. This system has a fail-safe feature in that in case any control line which actuates the remote control system if defective the entire station will automatically shut down.

In order to minimize the danger originating from engine backfires a rupture disc has been installed in the exhaust piping. This disc is made of thin gauge metal and has been serrated to insure its quick failure in case of severe engine backfire. The danger from crankcase explosion has been greatly minimized by the engine manufacturers.

Electrical hazards were reduced by eliminating high voltage current from the operating area.

Measures to reduce maintenance. This consideration was one that was given careful attention throughout the design of the stations. From a design standpoint there are two ways to minimize maintenance.

- **The first is to prevent repairs from becoming necessary.**
- **The second is to simplify them when they are necessary.**

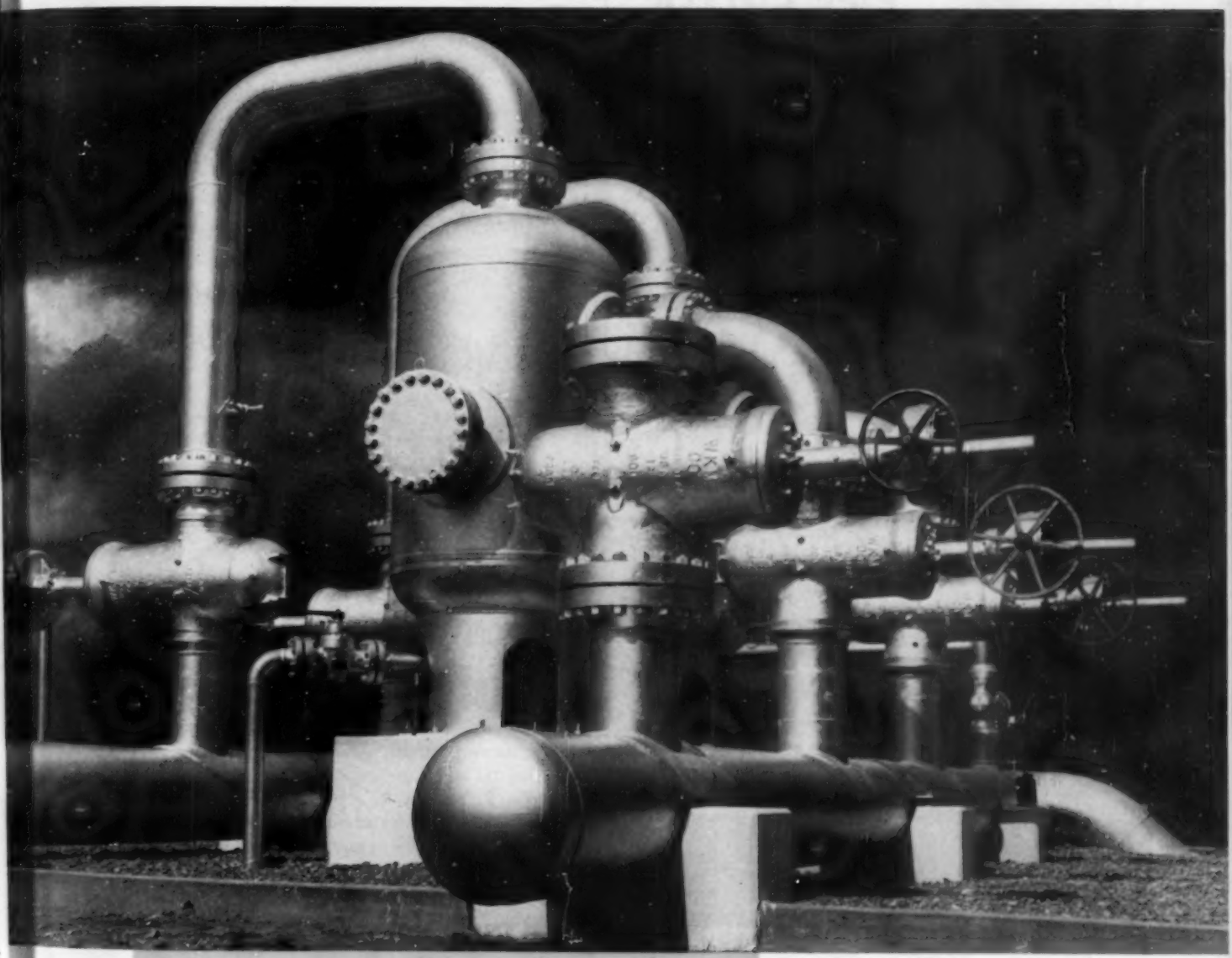
There is not sufficient space here to discuss this feature of the station design in detail, but here are examples of each of these two practices.

Since proper lubrication is one of the most effective ways to combat engine wear and maintenance, this factor was considered highly important in designing the stations. In normal operation, the oil from each engine circulates through a full-flow filter, thence to the heat exchanger and finally through a strainer before returning to the engine. Clay-type elements can be substituted for the cotton units in the full-flow filter when required. To further aid the operator in cleaning and conditioning the oil, all of the engines' lube systems were tied in to a common header, which permits the oil from individual engines to be successively centrifuged.

It is anticipated that these measures will aid in reduc-

Typical

. . . of pipeline installations all over the world is this view of W-K-M Through-Conduit Valves at a recently completed Gulf Interstate Gas Company Compressor Station. It is but one of five such stations in which W-K-M Valves are employed, in addition to the many larger W-K-M Valves used in the line itself.



Scrubber Installation, Delhi, La.

Most of the World's Most Modern Pipelines Are Tied Together with W-K-M Valves.

W-K-M Valves

W-K-M MANUFACTURING COMPANY, INC.

A SUBSIDIARY OF A.C.F. INDUSTRIES INCORPORATED

P. O. Box 2117 • Houston 1, Texas
Los Angeles, Calif.
Export Office: 45 Rockefeller Plaza, New York, N. Y.

STANDARD OF THE INDUSTRY . . .
for cutting steel or cast iron pipe . . .

THE
ALSTON
Rachet
PIPE CUTTER

There's none better for SPEED, SAFETY, POWER, ACCURACY and ECONOMY. It eliminates dangerous sparks . . . broken cutters; rollers hold pipe taut after cutting. It's easy on and off pipe . . . will cut 10" pipe in 12 min. Patented roller guides. Rachet makes it easy to work in close places.

A size for every requirement . . . write for details, literature and prices.

ALSTON MANUFACTURING COMPANY
P. O. Box 707 Phone 226
LIVINGSTON, TEXAS

DEPENDABLE POWER-
Ready When Needed

Where dependability, long life and efficient service are requirements, LeRoi Engines continue to make Oil Country history.

For 46 years Southern Engine & Pump Company has been serving industry with power units for every requirement. Skilled mechanics and competent counsel are available to you. We invite your inquiries.

SOUTHERN
ENGINE & PUMP COMPANY
MANUFACTURERS • MACHINERY FACTORS • CONTRACTORS

Service Facilities at: Houston — Dallas — Kilgore — San Antonio — Edinburg — Corpus Christi, Texas; Lafayette and New Orleans, La.

ing engine repairs and at the same time minimize the lube oil requirements.

In order to facilitate repairs to the complicated electrical controls, Gulf Interstate engineers worked up an annunciator system for the control cubicles. In case of trouble, a light on the outside of the cubicle indicates which relay needs repairs. This not only speeds repairs, but also enables ordinary maintenance men who may not be highly skilled electricians to replace the proper relay.

The key men . . .

HY BYRD
President, Gulf Interstate Gas Company

Hy Byrd, president, native Texan; graduated from University of Texas Law School; practiced law for several years prior to entering banking business in New York City; more than 20 years experience as official of several leading oil and gas companies.

Farrile S. Young, vice president in charge of operations and engineering—graduated from University of Kansas with degree in civil engineering; began engineering career with Phillips Petroleum Company; has held top engineering jobs with several oil and pipe line companies during the past 20 years.

Norman F. Blundell, chief engineer, graduated from University of Nevada with degree in civil engineering; more than 20 years experience in design and construction of pipe lines and attendant facilities for several nation's major pipe line concerns.

J. A. Staples, treasurer, graduate of Virginia Polytechnic Institute; served in accounting and treasury departments of various public utilities until 1937; with FPC 13 years prior to becoming associated with pipe line companies in 1950.

Sy Orlofsky, general superintendent of transmission department, graduate of Missouri School of Mines; served in U. S. Navy 1944-46; served in engineering departments of leading pipe line firms during past eight years.

—**The End**

NOW YOU CAN SHOW YOUR PIPE LINES ON THIS UNUSUAL NEW RELIEF MAP

Show your pipe lines in detail on this big, new, three dimensional map of the United States. With your pipe lines or service areas delineated, this plastic relief map is a handsome addition to executive offices, conference rooms or reception offices.

NEVER BEFORE A RELIEF MAP WITH ALL THESE FEATURES!

Sixty-four by forty inches (large enough for effective display) this map weighs only 2¼ pounds. Beautifully lithographed in 11 colors . . . formed from a single sheet of durable Vinylite plastic. You can see *and* feel the relief features. Shows more than 2,000 cities . . . many lakes, rivers, parks, national monuments. Self-framed. Easy to hang as a picture.

ORDER YOURS NOW!

AERO delivers your map to you flat and unformed, so your draftsmen may readily draft your pipe lines on the map. The map is returned to us, and we form it into a true relief map, showing your lines in relation to our country's topography. And—we lacquer the map to protect the surface through long years of use. Total cost for these unique maps—$50.00 each, delivered anywhere in the U.S.A. Order yours today.

Aero is now accepting pre-publication orders for similar plastic relief maps of Canada, New Jersey, and California.

AERO SERVICE CORPORATION

PHILADELPHIA 20, PENNSYLVANIA

Oldest Flying Corporation in the World

Affiliates in: TULSA, SALT LAKE CITY, OTTAWA

AIRBORNE MAGNETOMETER SURVEYS • PRECISE AERIAL MOSAICS
SCINTILLATION COUNTER SURVEYS • TOPOGRAPHIC MAPS
PLANIMETRIC MAPS • RELIEF MAPS • SHORAN MAPPING

For more data on advertised products, use Readers' Service Cards, last page.

Meet the Widest Range of flow measurement requirements with

AMERICAN-WESTCOTT A-88 ORIFICE METERS

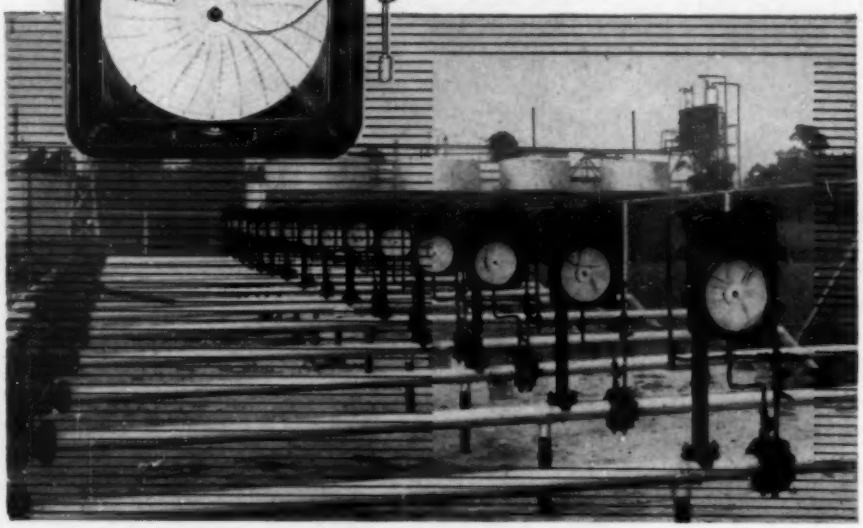
RECORDING · INDICATING
INTEGRATING · TELEMETERING

American A-88 standard mercury type orifice meters for working pressures to 5000 psi. in interchangeable 10,20,50,100 and 200-inch ranges give you complete versatility to meet any flow measurement requirement. Integrating instruments integrate both static and differential pressures giving totalized flow indications and telemetering equipped instruments transmit integrated indications to remote locations.

Recording Meters may be equipped with standard O-150°F. Temperature Elements, as illustrated, giving you every advantage of better temperature measurement with speed, accuracy, simple installation, economy and freedom from maintenance.

Wherever accurate recording and precision measurement are wanted...at high or low flow rates ... at varying temperatures ... there's a job for American® Series A-88 Orifice Meters.

Write for full details now.



AMERICAN-WESTCOTT MERCURY MANOMETERS GIVE YOU ALL THESE ADVANCED DESIGN FEATURES .....

- Minimum Simple Maintenance—easy access to float lever arm during calibration.
- Highest Accuracy—inherent straight line calibration.
- Interchangeable Ranges—no manifold piping changes.
- Pressure-Tight Teflon-Packed Stuffing Box—nearly frictionless, free from maintenance troubles, never needs lubrication.
- Teflon-Packed Pulsation Dampener—externally adjustable under full line pressure without leakage.
- Dependable Performance—improved check valves give positive shut-off for over-range protection.

AMERICAN® METER COMPANY

GENERAL SALES OFFICE: 1513 Race Street, Philadelphia
Albany • Alhambra • Atlanta • Baltimore • Birmingham
Boston • Chicago • Dallas • Denver • Erie • Houston
Kansas City • Los Angeles • Minneapolis • New York
Omaha • Pittsburgh • San Francisco • Seattle • Tulsa
IN CANADA: Canadian Meter Company, Limited, Hamilton
Edmonton • Calgary

Portable Units

Continued from Page 60

provided in another building.

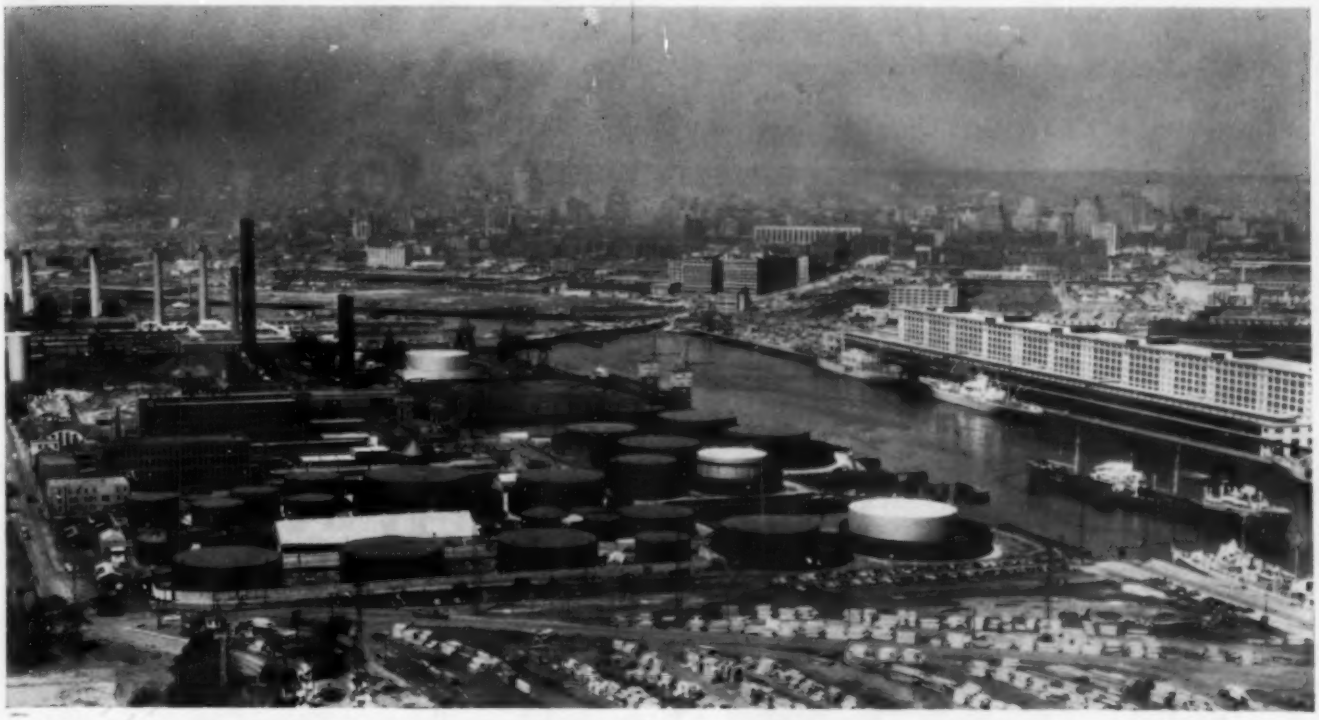
Weller station building is 30 feet by 90 feet and in addition to unit space provides for an operation room, sample room, washroom, chief's office, hallway, warehouse space, and a space for auxiliary equipment and work. The addition of a 15-foot bay between the operation office and the first unit cost little and added materially to ease of station operation. The chief's office is air-conditioned and both offices and washrooms are provided with automatic gas heat for winter.

It is interesting to note that this 30-foot by 90-foot building replaced a 40-foot by 205-inch pump house, a 25-foot by 40-foot office building and a 40-foot by 55-foot warehouse.

—The End

About the Author

WILLIAM LAW was born in Tyler, Texas, and attended high school at Mansfield, La. After studying at Tulane University, he received his degree in mechanical engineering at Louisiana State University. Law worked as a machinist at Mansfield, and as an assistant engineer in Baton Rouge before going to the Dominican Republic, where he became a construction engineer and later chief engineer of a sugar company there. Law returned to Louisiana to become manager of a local foundry and machine company. In 1934 he joined Interstate Oil Pipe Line Company as assistant master mechanic, and was promoted to master mechanic in 1943. Since 1946 Law has served Interstate as assistant superintendent of the Southern division, acting division chief engineer and assistant division general superintendent.



White Fuel Corporation's deep-water terminal, strategically located near the center of metropolitan Boston.

17 Bethlehem Oil Storage Tanks at White Fuel's South Boston Plant

This is the 1,500,000-bbl-capacity deep-water terminal of the White Fuel Corporation, one of N_w England's oldest and largest independent fuel suppliers. Here ocean-going tankers and coastal barges discharge refined products for domestic, industrial and commercial consumers throughout a widespread, bustling area.

Since 1938, White Fuel has steadily increased its storage capacity and now has a total of 17 tanks fabricated and erected by Bethlehem. These include a 154,000-bbl tank, three 121,000-bbl tanks, seven tanks varying from 50-100,000 bbl, and six of smaller sizes.

In addition, Bethlehem supplied eleven steel firewalls, varying from 20 to 30 feet high. The substitution of steel for earth dikes saved a great deal of valuable space, making it possible to install maximum tankage in the limited area.

If you are in the market for oil storage tanks, just contact the Bethlehem sales office nearest you. We'd be happy to answer your questions—and bid your requirements—promptly.

Especially adapted to severe Boston winters, this 67,000-bbl Bethlehem Lifter-Roof tank effectively controls air-vapor — minimizes breathing losses.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STORAGE TANKS

BETHLEHEM DESIGNS AND BUILDS CONE-ROOF TANKS — DOME-ROOF TANKS
UMBRELLA-ROOF TANKS — LIFTER-ROOF TANKS — FLOATING-ROOF TANKS
PRESSURE VESSELS — GAS HOLDERS — PROPANE TANKS

BETHLEHEM STEEL

For more data on advertised products, use Readers' Service Cards, last page.

REPUBLIC BUILDS *Uniformity*

INTO 3 KINDS OF LINE PIPE...

Electric Fusion Weld Line Pipe—shown here is for high pressure gas line from Petersburg, Ohio, to Cleveland, Ohio. Uniform circumference and wall thickness of this 26″ pipe assure high speed welding operation. Republic's rigid standards of quality control guard against pipe that is not uniformly straight.

Continuous Butt Weld Line Pipe—here used on central flowing manifold near Kilgore, Texas. Republic's proved continuous weld process assures uniform wall thickness, diameter and concentricity . . . is easy to bend and thread. It comes in economical long lengths and extra-long lengths.

Electric Resistance Weld Line Pipe—in 10¾″ size, will carry crude oil between Oklahoma and Texas. High ductility of steel permits easy field bending to match terrain. And each length is consistently uniform. Result: faster laying time, lower installation costs.

Uniformity is one outstanding feature all Republic Line Pipe has in common. It's perhaps the most important reason thousands upon thousands of satisfied customers use more and more Republic Line Pipe each year. To them, *uniformity* means all-around protection for their investment. It means fast, economical installations, dependable service.

Take Republic's Expanded Electric Fusion Weld Line Pipe, for example. This big pipe—sizes 24″ to 30″ O.D.—is electric fusion welded inside and out, then hydraulically expanded to uniform size, straightness, and circumference to increase its high yield strength. It goes in fast. Because circumference is constant, field joints line up quickly and accurately, can be welded at top speed. And, to further speed welding, uniform wall thickness provides an even distribution of metal all around the pipe.

Republic Electric Resistance Weld Line Pipe—sizes 2⅜″ to 16″ O.D.—is formed from flat rolled steel, uniformly thick from side to side and end to end. This results in uniformly concentric pipe, uniform in wall thickness—easy to line up, easy to weld. Its high ductility assures smooth, uniform bends in the field or in the shop. Uniform, high-yield strength permits building high pressure lines. And clean surfaces inside and out prevent clogged valves and regulators, often caused by scale loosened after blowing out the line.

Republic's Continuous Butt Weld Line Pipe has been a standby in the oil industry for many years. Available in nominal sizes ⅛″ to 4″, it's used for gathering and distributing lines plus other oil and gas handling needs. Users have come to depend on its uniform strength and ductility, long-lasting galvanized coating. They like the way it is quickly threaded, readily welded, easily bent.

Republic Steel Corporation has been a leader in the pipe-making industry for more than 25 years. Naturally we're proud of this record. And, we're proud of the hundreds of thousands of miles of Republic Line Pipe now successfully in use. Remember: when you need line pipe for oil and gas transmission, high or low pressure, you can get all three kinds from Republic. Write for literature.

REPUBLIC STEEL CORPORATION
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, New York

How to do it

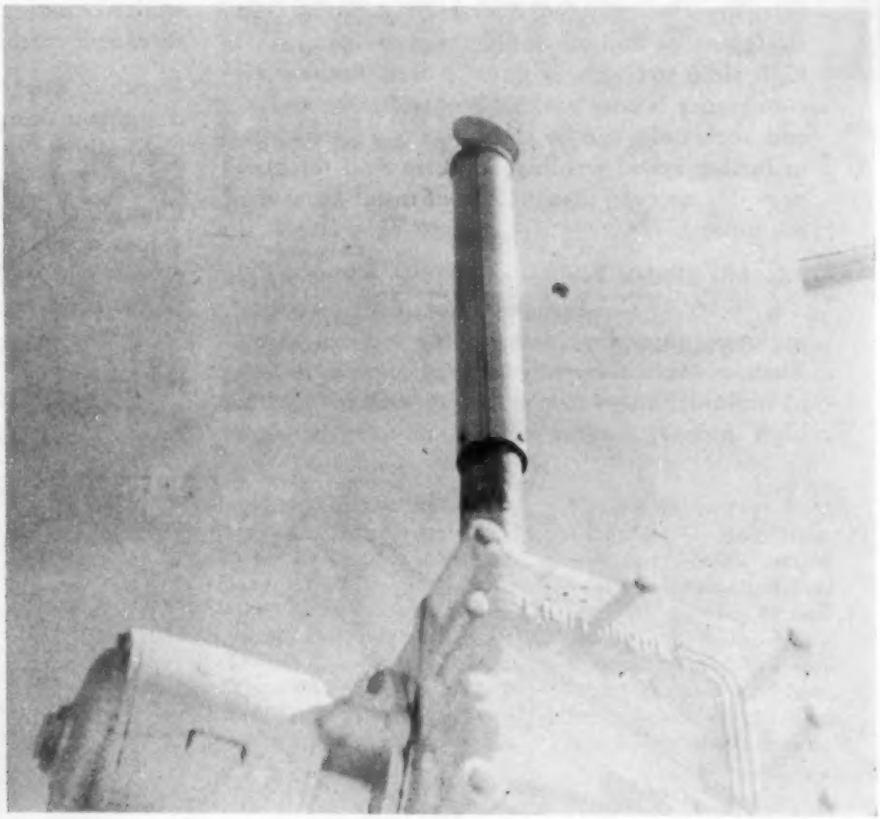
PIPE LINE HINTS

$10 is paid for each illustrated acceptable contribution. Mail to The Editor, PIPE LINE INDUSTRY, P. O. Box 2608, Houston 1, Texas

C Clamp Used to Fasten Warning Flag to Pipe

Instead of tying the red warning flags to the back of a trailer load of pipe to a single projecting joint with a piece of wire or string, as is commonly done, one pipe truck operator procured small C clamps from the dime store and attached the end of a crimson-colored cloth to the yoke of the clamp as shown.

By tightly clamping the C clamp to the end of the pipe joint extending fartherest rearward, the warning flag is fastened securely to the load to serve as a warning to all approaching traffic. To attach and detach the flag from load to load is an easy task.



Sleeve Protects Valve Indicator

In modern pump stations—usually operated semi-automatically—valves are equipped with a visual indicator which shows whether the valve is open or closed.

The indicator is simply flagged at the top with a metal disc or other easily seen device which rises when the valve is open. The disc is atop a rod which passes down a drive sleeve into the gear cage. The rod passes through a bushing at the top of the drive sleeve, which is lubricated in an effort to make it waterproof.

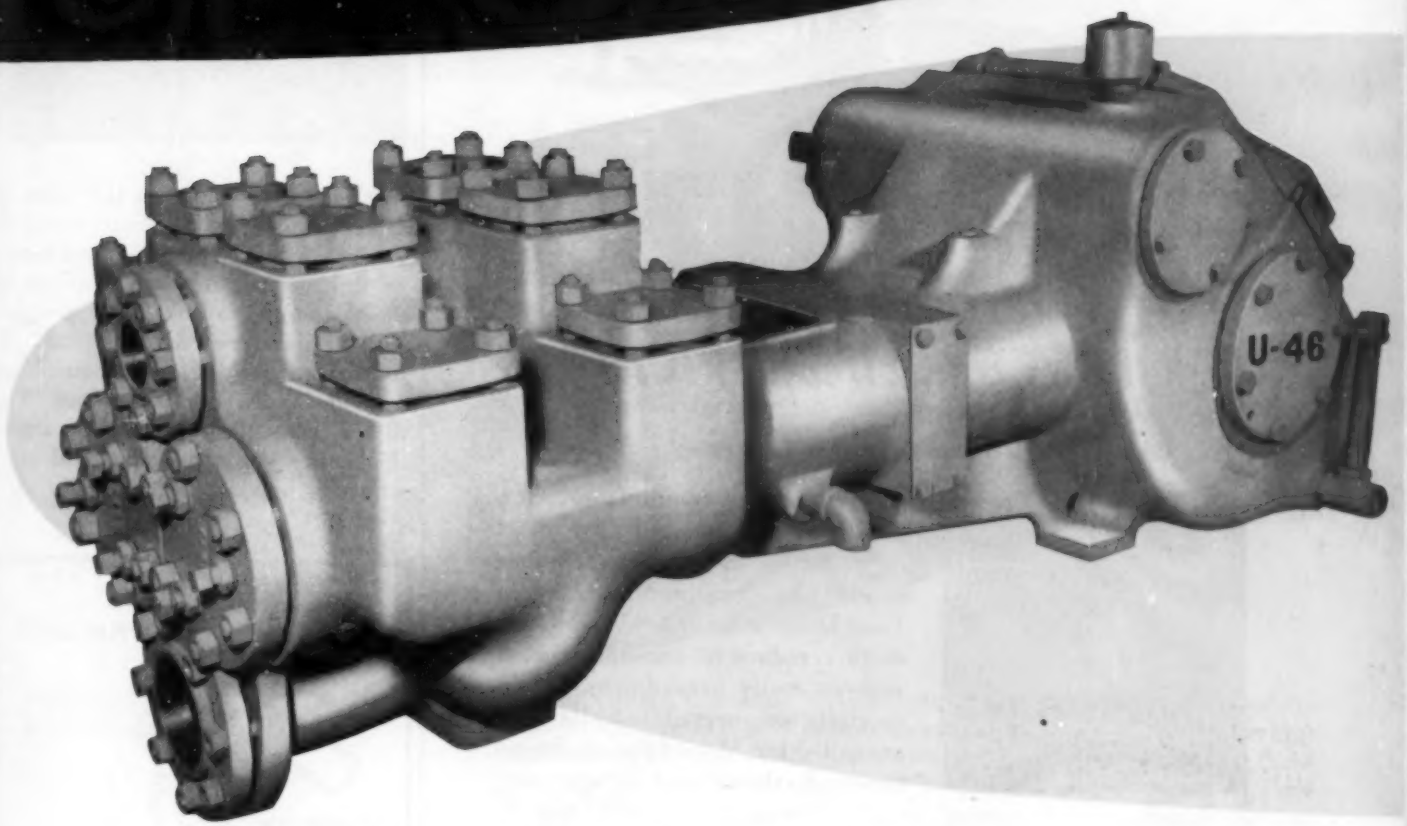
In actual use, water leaks in around the rod and into the gear cage. An extremely simple and inexpensive device to prevent this leakage is a galvanized sleeve soldered to the base of the disc on the indicator stem. This sleeve rises and falls as the valve opens and closes, making the dry sleeve completely watertight at the top.

Spool Piece on Positioner Aids Precision Welding

This illustrated welding positioner features a novel spool piece. The automatic welding head moves to any angle and is easily rotated. Operated by a hand-powered gear attachment, the device requires little physical exertion.

The spool piece bolted to the center of the positioner decreases in diameter

You've Never Seen Such a Versatile Pump!



Bethlehem's U-46 is a small pump, but what a busy one! It's intended for general utility work, and we think it's the most versatile unit ever offered for this service.

The U-46 is a horizontal, duplex, double-acting pump with 4-in. maximum liner bore and 6-in. stroke. When used for conventional jobs, such as fresh-water pumping around the rig, it is furnished with alloy cast-iron liners. For handling salt water and other corrosive fluids, bronze liners, piston rods, valves, and valve seats are furnished. All-aluminum-bronze fluid end and accessories are also available. Moreover, fluid-end parts of correct materials can be supplied for oil and drilling-fluid service.

You'll find that your Bethlehem U-46 will seldom be idle. It is as much at home around the lease on gathering work as it is on the rig. This is a handy little unit that fits in anywhere, without fuss or bother. It's so easy to move that setting it up in a new location is never a problem.

The U-46 can be used with any type of prime mover—electric motor, gas or gasoline engine, etc. For further details and specifications, check with the nearest Bethlehem Supply office or store.

In addition to drilling-rig equipment and a full range of pumping units, Bethlehem offers Beth-Co-Weld line pipe, Purple Strand wire rope, and a complete variety of sucker rods, fasteners, etc. Ask for these products when you are next equipping your oil-country installations.

BETHLEHEM SUPPLY COMPANY

General Offices: 21 E. Second St., Tulsa, Okla.
West Coast Headquarters: Los Angeles, Calif.
Export Distributor: Bethlehem Steel Export Corporation
25 Broadway, New York, N. Y.

BETHLEHEM STEEL

in the Field

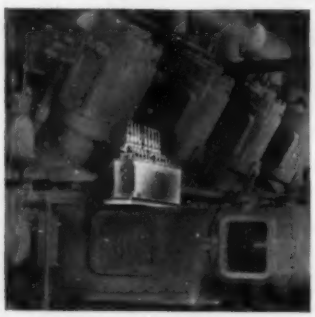
on the Pipe Lines

in the Plants

It's MANZEL

FOR FORCE FEED LUBRICATORS

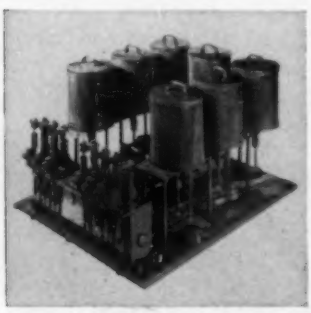
Pressure Application — Exact Amounts — Accurately Timed



On pumps and compressors . . . on engines and other machinery . . . dependable, automatic lubrication can best be had with Manzel Force Feed Lubricators. They lower labor costs . . . reduce oil consumption . . . prevent costly breakdowns. When specially engineered installations are called for, Manzel has the know-how to do them.

AND FOR CHEMICAL FEEDERS

Single or Multiple Feed — From a Few Drops to 60 gal./hr.



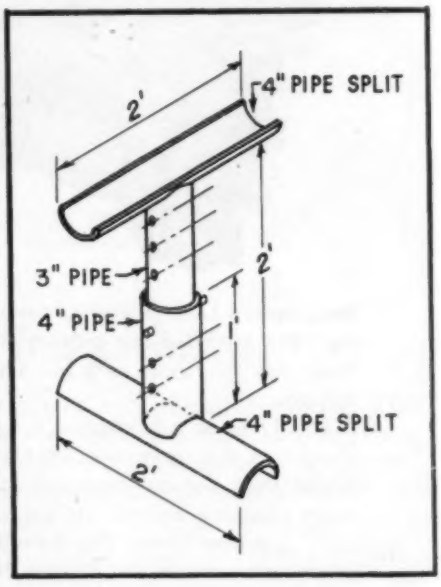
In pipe lines, oil tank and bottom hole treatment, Manzel Chemical Feeders automatically introduce the various compounds in accurately measured quantities. You eliminate guesswork, inaccuracy and neglectfulness. Here again, if unusual installations are called for, the Manzel organization will engineer them. For information write:

Manzel

DIVISION OF FRONTIER INDUSTRIES, INC.
281 BABCOCK STREET BUFFALO 10, N. Y.

HINTS . . .

from about 14 inches at the point of attachment to the positioner down to 10 inches at its outer end. Clamps fit through the notched portions of the spool and are held in position with thumbscrews. As the table is rotated, the welding device maintains a rigid line around the spool. The device is useful for building up metal thicknesses on parts that will subsequently be machined.

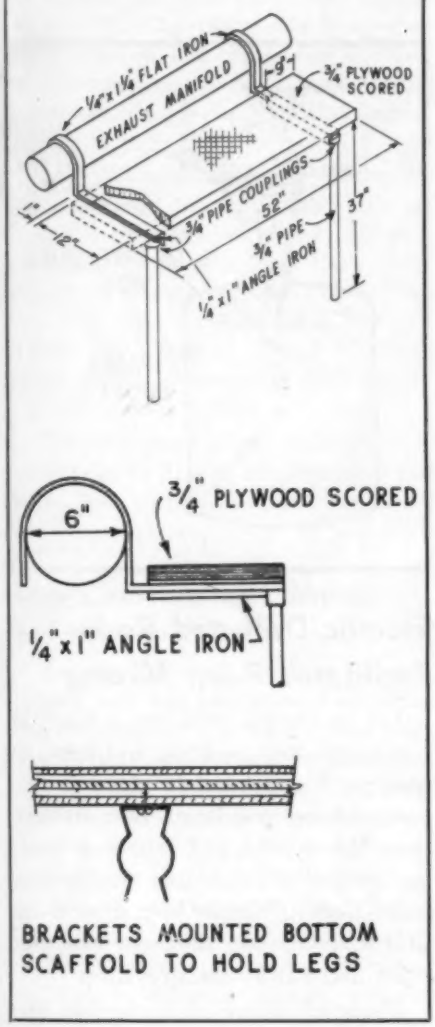


Temporary Rack Aids In Classifying Pipe

Build criss-cross stanchions of four-inch and three-inch pipe to minimize the job of erecting temporary pipe racks for classifying pipe as it is being unloaded. A small amount of a welder's time and about 4 feet of four-inch pipe, 18 inches of three-inch pipe and a short length of five-

eighths-inch rod are needed to make each stanchion unit.

When pipe comes in from the field, it is necessary to grade it before it can be reconditioned and salvaged. By erecting a pipe rack of these units, this job can be greatly simplified and speeded up.



Portable Scaffold Speeds Engine Maintenance Jobs

Build a portable scaffold that fits right on an engine and simplify many of the maintenance jobs. The scaffold has two V-shaped clamps made of one-fourth inch by one-fourth inch strap steel bent to fit snugly on the exhaust manifold. Light angle iron extends out to the vertical pipe lugs which are sized to fit any particular engine. A 12-inch by 5-foot piece of three-fourths inch plywood is scored to provide best footing.

This small scaffold can not only make maintenance work easier, but also makes it safer.

United Towing Co. reports LATTICE BRAID* *outlasts* previous pump packings 26 to 1

*Registered Trademark. *Only* Garlock makes LATTICE BRAID rod and shaft packings.

United Towing Company of Wilmington, Cal. tried a number of packings on their rotary gear pumps handling *cold* molasses* and operating at 120 p.s.i. In starting the pumps, the cold molasses would ruin these packings. In fact, no packing would last more than 8 to 10 hours. That is, until United Towing tried rugged LATTICE BRAID asbestos packing with wire insertion and wire corners. In actual running time, LATTICE BRAID has lasted for 260 hours—26 times longer than any previous packing.

Put Garlock LATTICE BRAID Packing to work for your company. All the braided strands of this unique packing are lattice linked together into one structural unit. The strands hold together even when the packing is worn far beyond the limits of wear of ordinary braided packings.

LATTICE BRAID is made from flax, cotton, asbestos, wire-inserted asbestos, Teflon, and asbestos with Teflon impregnation—for various types of services.

Get all the facts about LATTICE BRAID *Packings. Contact your Garlock representative or write for new folder AD-131.*

THE GARLOCK PACKING COMPANY, PALMYRA, NEW YORK

Sales Offices and Warehouses: Baltimore • Birmingham • Boston • Buffalo • Chicago • Cincinnati • Cleveland Denver • Detroit • Houston • Los Angeles • New Orleans • New York City • Palmyra (N.Y.) • Philadelphia Pittsburgh • Portland (Oregon) • Salt Lake City • San Francisco • St. Louis • Seattle • Spokane • Tulsa.

In Canada: The Garlock Packing Company of Canada Ltd., Toronto, Ont.

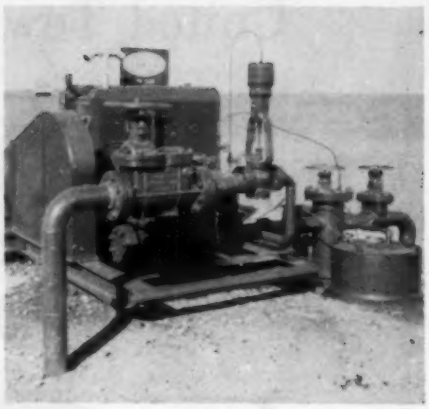
GARLOCK LATTICE BRAID PACKING

For more data on advertised products, use Readers' Service Cards, last page.

Buried Steel Drum Catches Waste Oil

To keep things clean around the field pipe line pumps, one company uses a partly buried steel drum to catch all waste oil, then runs a suction line to the bottom of the drum and saves it in the pipe line runs.

The drum is buried to the top ring at a point near the suction of the pump and a one-inch pipe run to the bottom from the downstream side of the gate valve on the suction line. When it is necessary to empty



the drum, the suction gate valve is pinched so that there is a vacuum on the one-inch and the drum is easily sucked into the system.

The bleeder and drain lines are hooked up by means of copper tubing and drain the air bleeder on the discharge line of the pump and the two oil drain pans on the pump so that the lube oil does not make a mess.

When you buy STURDYBILT Prefabricated Houses you need never to lose your original investment. Any STURDYBILT House can be moved to your new site, or sold to another company for erecting on its lease.

Check the advantages of STURDYBILT houses, garages, warehouses, tool houses and other buildings before you buy any oil field housing.

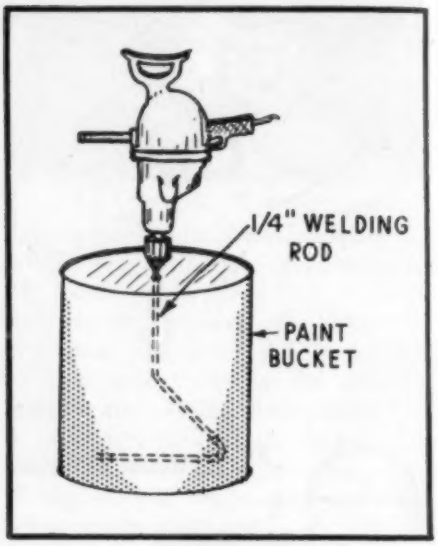
■ WRITE FOR INFORMATION

MANUFACTURERS OF SPECIAL MILLWORK: DISTRIBUTORS OF JOHNS-MANVILLE BUILDING MATERIALS: CURTIS WOODWORK

STURDYBILT PREFABRICATED, DEMOUNTABLE HOUSES

SOUTHERN MILL & MANUFACTURING CO. • TULSA, OKLAHOMA

STURDYBILT HOUSES COMPLY WITH COMMERCIAL STANDARD CS 120 OF THE NATIONAL BUREAU OF STANDARDS FOR PREFABRICATED HOMES



Electric Drill and Rod Facilitates Paint Mixing

Let an electric drill and a piece of one-fourth-inch welding rod bent as illustrated eliminate the slow, sloppy paint mixing paddle at your station. Bend the welding rod as shown, leaving plenty of clearance inside the paint bucket. Simply slip it into the drill and you will find you can mix paint and hardly splash a drop.

There are many advantages to this method as compared with the old familiar paint paddle, which not only fails to mix the paint well, but is wasteful and messy.

Junk Pipe Makes Conductor For Ground Currents

A simple economy for cathodic protection of a pipe line can be effected with old junk pipe or boiler tubes which are ready for the junk man. Instead of using cables to carry the ground currents, the pipe is welded together to make a conductor from the pipe line to carbon anodes.

WHAT'S HAPPENING

IN PIPE LINE CONSTRUCTION

Longest Undersea Line to Be Laid

Magnolia Petroleum Company, Newmont Oil Company and Continental Oil Company, which operate as a team in Louisiana-Gulf offshore areas, have awarded the contract for construction of the world's longest undersea pipe line.

The 48-mile undersea gathering line, designed to carry both crude oil and gas from offshore fields, will run in a dog-leg pattern from Burns Terminal on the coast of St. Mary's Parish, La., into the Gulf of Mexico to Block 126, Eugene Island oil field, most distant offshore oil discovery in the Continental Shelf.

The first phase of the line extending to Blocks 45-51 will be completed this year, the rest of construction to be finished around the middle of 1955. The line will be operated by Magnolia. Contract was awarded to Brown and Root of Houston. The line will have an ultimate capacity of some 50,000 barrels of crude oil per day when the entire project is completed.

New Construction Company Is Formed in Alberta

Dutton-Williams Brothers Limited, a new pipe line and general oil industry engineering and construction company, has been formed by Canadian Pipe Line Construction Company Ltd. and Williams Brothers Corporation (Canada) Ltd. Office of the new company is in Calgary, Alberta.

At present, Dutton-Williams Brothers Limited, sponsors, in joint venture with Mannix Ltd., under the name of Dutton-Williams-Mannix, are preparing an engineering and economic study for Alberta Gas Trunk Line Company Limited.

Midwestern Constructors Divided Into Two Firms

Midwestern Constructors, Inc., one of the nation's major pipe line construction firms, has recently been divided into two companies.

The new corporation, Tuloma Builders, Inc., will handle gasoline plant, industrial plant, gas compressor station and oil pump station engineering and construction. Midwestern Constructors will specialize in pipe line construction. Both companies will have offices in Tulsa.

Service Pipe Line Lets Contract for 628-Mile Line

Contracts for construction of Service Pipe Line Company's 628-mile big-inch crude line between Ft. Laramie, Wyo., and Freeman, Mo., have been let.

The 20, 22 and 24-inch line will provide improved service for oil producers of western Kansas, the Rocky Mountain Region including Wyoming, and the Denver-Julesburg Basin.

Building contractors are O. R. Burden Construction Corporation, Tulsa, and H. B. Zachry Company, San Antonio. J. L. Cox and Son, Raytown, Mo., Parkhill Trucking Company, Tulsa, and John Bunning Transfer, Rock Spring, Wyo., will string the pipe along the right-of-way.

Jet Fuel Line Planned For Wichita Air Base

Plans for an 83-mile gasoline and aviation jet fuel pipe line from the Ponca City, Okla., refineries of Continental Oil Company and Cities Service Company to the government's Wichita, Kansas, Air Force Base have been announced by Cherokee Pipe Line Company.

Cherokee, recently formed by Continental and Cities Service, has purchased from Shell Pipe Line Company a crude line including both trunk lines and field gathering systems extending from Tonkawa, Okla., to Elyria, Kansas, 75 miles of which will be converted to the gasoline and jet fuel system to the air base. They will construct eight miles of new line to complete the system. The remainder of the crude system will be tied into

"WELD" your Rigid Vinyl Pipe

with plasjoin®

VC PIPE CEMENT

PLASJOIN VC Pipe Cement has been developed to do for rigid Polyvinyl Chloride Pipe what welding does for metal pipe. Only a brush is needed to apply economical PLASJOIN Cement in the field. It sets rapidly, gives a tough, positive, permanent bond.

Available in gallon, quart, pint and half-pint cans, ready-to-use PLASJOIN VC saves mixing time and avoids the hazards of preparation in the field. Rigid controls assure uniform quality from shipment to shipment.

Extensive tests show that rigid vinyl pipe joints cemented with PLASJOIN VC are as strong as, if not stronger than, sections of straight un-"welded" pipe.

PLASJOIN VC Cement is sold by your rigid vinyl pipe supplier.

MERRITT PRODUCTS CO.
1547 EAST 18TH STREET
CLEVELAND 14, OHIO

For more data on advertised products, use Readers' Service Cards, last page.

CLEANING, COATING, WRAPPING & RECONDITIONING

★

HOT DOPE

Straight from the Kettle on PIPE PROTECTION

★

By Boyd Mayes

• Ever think about how specialized everything's gettin' to be? One doctor helps get the baby born, and right there he quits. You gotta get another specialist to keep the kid going. One mechanic works on your automobile brakes and sends you around the corner to get the radiator leak mended. Try gettin' your house fixed and the brick man won't touch the boards. If it keeps up the present trend you may some day have to have a separate painter for each color. Specialization is really not new. In the frontier days of West Texas the cow man was always takin' pot-shots at the neighbor who raised sheep. We got our idea of specialization as a kid back in the Piney Woods when we found that a coon dog that would mess with a skunk wasn't worth shootin'. There's a special way to split a stick, too, if you want to put a possum's tail in the crack. Specialization's a good thing, and we're all for it. We live by it. We specialize in the pipe line business, and we go further than that. We're almost in the same category as the foot doctor who won't work on nothin' but left big toes. We don't make pipe, don't bend it, don't dig ditches for it, don't string it nor lay it. We don't make pipe winches, booms, cradles, saddles, Holiday detectors or any other pipe line accessories. We just protect pipe for long life, trouble-free service by cleaning, priming, coating and wrapping it. At that, we admit we're good. We've been doing this specialized job for more than a quarter century. The woods are full of our satisfied customers, but we could still use some more.

MAYES BROS.

1130 McCarty — HOUSTON, TEXAS — OXford 7586

Continental Pipe Line Company's Kansas system extending to Ponca City.

Conoco and Cities Service will build a terminal at Wichita and are negotiating to make a direct pipe line connection to the Wichita Air Base.

Products Flow Through New 475-Mile Line

The first barrel of products to flow through the new 475-mile Oklahoma-Mississippi River Products Line, Inc., extending from Sunray Village (Duncan), Okla., to a terminus on the Mississippi River at West Memphis, Ark., arrived at the eastern terminus in mid-August.

The first shipment to make the ten-day trip across two states was distillate from Sunray Oil Corporation's refinery south of Duncan. Sunray owns 50 percent of the common stock of the Oklahoma-Mississippi company.

Approximately 334,000 barrels of products are required to fill the line from Sunray Village to West Memphis. Throughput capacity of the line is 44,000 barrels daily.

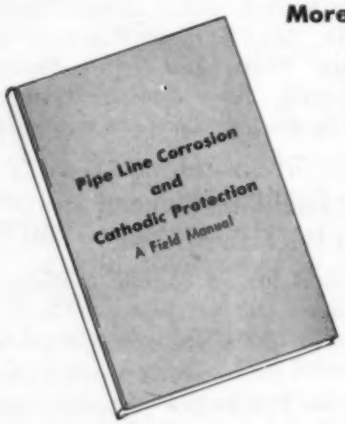
The line is 10 inches in diameter from Duncan to Allen, Okla., 8 inches from Drumright-Bristow to Allen and 12 inches from Allen to West Memphis. There are seven pump stations along the line, and river terminal barge-loading facilities at West Memphis.

Valley States Oils, Inc., a recently-organized marketing company, has contracted with Sunray and Kerr-McGee Oil Industries to buy products of these two companies transported through the Oklahoma-Mississippi line.

Shell Awards Contract For Montana Line

Construction of Shell Pipe Line Corporation's 35-mile, 12-inch crude line along the Baker-Glendive Arch in Montana will begin immediately. Anderson Brothers Corporation of Houston has been awarded the contract.

The line, to run from the Cabin Creek field through the Pine Unit field to a tank car loading rack on the Northern Pacific Railroad near Glendive, Mont., will handle present production from the two fields with reserve capacity for future expansion.



More comments on this new Handbook:

"... a most practical on-the-job manual for men concerned with pipe line corrosion. We are ordering copies for each of our district engineers."

Pipe Line Corrosion and Cathodic Protection

By MARSHALL E. PARKER

This Handbook, written by Marshall E. Parker, consultant, is designed as a practical field manual. It is a 108-page pocket-size volume printed first as a popular series in WORLD OIL. The Handbook is illustrated with many charts and drawings and is completely indexed by subjects.

It presents comprehensive data on Soil Resistivity Surveys, Potential Surveys, Line Currents, Current Requirements, Rectifier Systems, Ground Bed Design, Magnesium Anodes, Stray Current Electrolysis, Interference in Protective Systems, Operations and Maintenance, and Coating Protection and Testing.

An appendix has been added of technical data on Underground Corrosion, Basic Principles of Cathodic Protection, Properties of Metals and Attenuation Equations. Order copies of this practical Field Manual now for each of your field men. Price $3.

Send for your FREE copy of the New Petroleum Book Catalog which describes the nature and contents of many books pertaining to the Petroleum Industry.

ADDRESS:

Book Department
GULF PUBLISHING COMPANY
P. O. BOX 2608
HOUSTON 1, TEXAS

Pipe Line Contracts Not Let

COMPANY	Length in Miles	Diameter	Type	Origin and Terminus	Estimated Cost	Status
Alabama-Tennessee Natural Gas Co.—Florence, Ala.	25	8, 12	Gas	Alabama	$808,450	Proposed
American Louisiana Pipe Line Co.—666 Penobscot Building, Detroit, Mich.	1,289	22, 30	Gas	Acadia, La.—near Detroit, Mich.	$130 million	Proposed
American Pipe Line Corp.—New York City (Swinerton & Walberg, Engineering)	1,425+ 485 mi. feeders & distribution lines	24, 26	Products	Beaumont, Texas, area—Newark, N.J.	$170 million	Out for bids
Anadarko Basin Pipe Line Co.	525	24	Gas	Wise County, Texas—Texas Eastern near Memphis, Tenn.	.....	Planned
Arkansas Louisiana Gas Co.—Slattery Building, Shreveport, La.	136	6-24	Gas	Loops along system to increase deliveries to 816 mmcf	$10,072,305	Some contracts let
Ar-Mex Pipe Line Co.	900	....	Crude	Wyoming-Phoenix, Ariz.	$31 million	Planned
Attock Oil Co.	60	....	Gas	Dhulian Field—Rawalpindi, West Pakistan	.....	Planned
Badger Pipe Line Co.—Bartlesville, Okla.	196	8, 10, 12	Products	Chicago—Madison, Wis.	$15 million	Some contracts let
H. W. Bass & Sons Co.	152	4, 6	Products	Duval and Live Oak counties—Corpus Christi, Tex.	.....	Planned
California-Oregon Pipe Line System	103	6	Crude	Crescent City, Calif.—Medford, Ore.	.....	Planned
Carolina Natural Gas Corp.—701 Wilder Building, Charlotte, N.C.	185	2, 12	Gas	North and South Carolina	.....	Proposed
Central Hudson Gas & Electric Co.	48	12	Gas	Albany—Kingston, N.Y.	.....	Applied to FPC
Cherokee Pipe Line Co.	5	....	Products	Near Wichita, Kans.	.....	Planned
Cheyenne Valley Pipe Line Co.	58	10	Crude	Lance Creek—Fort Laramie, Wyo.	$1,838,241	Proposed
Cities Service Gas Co.—1st National Bank Building, Oklahoma City, Okla.	33	20,26	Gas	To replace lines in Kansas and Missouri	$1,860,000	Authorized
	13	....	Gas	Labette County, Kans.	$285,000	Authorized
	15.5	16	Gas	Carter County—Garvin County, Oklahoma	$541,050	Authorized
City of Dalton, Ga.	39	8	Gas	To connect with Southern Natural Gas Co. line	$2,9<0,000	Proposed
Coast Counties Gas & Electric Co.—369 Pine St., San Francisco	40	3, 4, 8	Gas	Coast and Valley region, California	.....	Planned
Colorado Interstate Gas Co.—Colorado Springs, Colo.	365	22	Gas	Rock Springs, Wyo.—Denver, Colo.	$23,299,000	Authorized
	115	4, 6, 8	Gas	Denver-Julesburg Basin—Basin Cities	.....	Before FPC
Colorado Western Pipe Line Co.—Dallas, Tex.	708	....	Gas	Southeastern Colorado fields—Denver plus laterals	$30 million	Planned
	328	16, 18	Gas	LaPlata County—Pueblo, Colorado Springs, & Denver	$21,600,000	Authorized
Compania del Oleoducto Buenaventura—Cali, Colombia, S.A.	90	....	Products	Buenaventura—Cali, Colombia	$4 million	Planned
Dixie Pipe Line Co.	20	8	Gas	Gwinville Field, Mississippi—Transcontinental Gas line	$425,000	Proposed
El Paso Natural Gas Co.—Bassett Tower, El Paso, Tex.	32.5	10	Gas	Reagan and Upton counties, Texas	$799,000	Authorized
	74	....	Gas	Texas, New Mexico, and Arizona	$13,800,000	Proposed
Empresa Nacional del Petroleo	80	6	Products	Concon—Santiago, Chile	.....	Planned
Equitable Gas Co.—420 Boulevard of the Allies, Pittsburgh 19, Penn.	12	Various	Gas	Marion and Wetzel counties, West Virginia	$2 million	Authorized
Glacier Gas Co.	626	16, 20	Gas	Canada—Montana, Idaho, and Washington	.....	Planned
Gas Service Co.—Kansas City	12	....	Gas	To connect with Cities Service Gas Co. line	$650,000	Planned
Governments of Southern Rhodesia and Portuguese East Africa	200	....	Products	Beria, Portuguese Mozambique—Umtalia, Southern Rhodesia	.....	Considered
Home Gas Co.—Binghamton, N.Y.	32	12	Gas	Breesport—Union Center, N.Y.	.....	Planned
Hope Natural Gas Co.—445 W. Main St., Clarksburg, West Virginia	33	8, 10, 12	Gas	Wyoming County, West Virginia—Buchanan County, Virginia	.....	Proposed
Houston Texas Gas & Oil Co.—4604 Main St., Houston	1,542	Various	Gas	Louisiana—Florida	$148 million	Proposed
Idaho Natural Gas Co.—Goodland, Kans.	....	....	Gas	Pacific Northwest line—points in southern Idaho	.....	Proposed
International Pipe Line Co., Inc.—227 N. Colfax Ave., Minneapolis, Minn.	132	8	Products	Wrenshall, Minn.—Minneapolis Bulk Terminal	$4,250,000	Proposed
Interstate Oil Pipe Line Co.	32	8	Crude	Gwinville Field, Mississippi—Soso Field, Mississippi	.....	Out for bids
Kansas-Nebraska Natural Gas Co.—Phillippsburg, Kans.	221	6-12	Gas	Central and northeast Nebraska	$4,096,890	Some contracts let
Lateral Gas Pipe Line Co.—Cedar Rapids, Iowa	27	4	Gas	Grant—Clarinda, Iowa	$267,000	Proposed
Manufacturers Light & Heat Co.—Pittsburgh, Penn.	51	....	Gas	13 projects in Ohio, Pennsylvania, and West Virginia	$4,099,250	Authorized
Mayflower Pipe Line Co.—(Pine Tree Natural Gas Co. —70 Pine St., New York, N.Y.)	200	....	Products	New Jersey refining area—New England	.....	Planned
Michi, Inc.	220	10	Crude	Highland, Ind.—Michigan refineries	$6 million	Has ODM certificate of necessity
Michigan Consolidated Gas Co.—415 Clifford, Detroit 26, Mich.	25.5	12	Gas	Sparta—Muskegon, Mich.	$13 million	Proposed
Michigan-Wisconsin Pipe Line Co.—500 Griswold, Detroit 26, Mich.	252	4-24	Gas	Wisconsin	$11 million	Proposed
Mid-Saskatchewan Pipe Line, Ltd.	23	8	Crude	Smiley Field—Kerrobert	.....	Proposed
Missouri Central Gas Co.	25	6	Gas	Moberly—Macon, Mo.	.....	Proposed
Missouri Public Service Co.—Warrensburg, Mo.	136.4	8-10	Gas	New Franklin, Mo.—Grundy County, plus laterals	$5 million	Proposed
Montana-Dakota Utilities Co.—Minneapolis, Minn.	56	2, 4, 6	Gas	Hettinger and Stark counties, North Dakota	$728,854	Authorized
Moore Stoner Co.	200	6	Products	Glendive, Mont.—Minot, N. D.	.....	Planned
NATO	1,920	4-10	Products	To serve military bases in Western Europe	.....	Foster-Wheeler prime contractor
Natural Gas Pipe Line Company of America—20 N. Wacker Dr., Chicago	240	24	Gas	Carter, Garvin, and Stephens counties, Oklahoma—Hutchinson County, Texas	$30 million	Planned
Natural Gas Producers, Inc.—Colorado Springs, Colo.	100	12	Gas	Yenter Pool—Denver, Colo.	.....	Planned
Nebraska Pipe Line Co.	220	6	Products	Cheyenne, Wyo.—North Platte, Neb.	$4 million	ODM certificate granted
New River Gas Co.	50	....	Gas	Sumners-Monroe counties, West Virginia, and Narrows Dublin, W. Va.	.....	Planned
NNCW Pipe Line Co.—Dallas, Texas	127	8, 10	Crude	Clareton Field—Casper, Wyo.	$3,600,000	Planned
Northern Indiana Fuel & Light Co.—Auburn, Ind.	35	10	Gas	Edgerton—Auburn, Ind.	$876,814	Planned
Northern Natural Gas Co.—2223 Dodge St., Omaha, Neb.	167	24	Gas	Farmington, Minn.—Duluth, Minn., and Superior, Wis.	$12 million	Before FPC
	329	2-12	.....	Sioux Falls—Aberdeen, S.D.	$6,661,100	Proposed
	310	24	Gas	Tioga—Fargo, N.D.	$18,494,000	Planned
	....	....	Gas	To interconnect with Natural Gas Pipe Line	$244,000	Planned
North Dakota Natural Gas Co.—St. Paul, Minn.	500	6, 10, 12	Gas	Tioga, N.D.—Minot, Fessenden, Devils Lake, and Fargo, N.D., plus 6" feeder lines	$10,800,000	Proposed
Northwestern Utilities, Ltd.—10124 104th St., Edmonton, Alberta, Canada	42	12	Gas	Bonnie Glen—Edmonton, Alberta	$1,400,000	Proposed
Ohio Fuel Gas Co.—Columbus, Ohio	24.5	20	Gas	Richland and Crawford counties, Ohio	$1,072,000	Authorized
	46	20, 24	Gas	Jackson, Vinton, Hocking, and Fairfield counties, Ohio	$3,832,700	Authorized
	28	....	Gas	Various Ohio counties	$832,700	Proposed
Orchard Pipe Line Co.—Denver, Colo.	45	8	Crude	Orchard—Merino, Colo.	$811,000	Planned
Pacific Northwest Pipe Line Corp.—M. & M. Building, Houston	1,466+ 443	Various	Gas	San Juan Basin—Pacific Northwestern states	$160 million	Approved
Panhandle Eastern Pipe Line Co.	575	30	Gas	Kansas—Michigan	$67 million	295 miles authorized
Pawnee Pipe Line Co.	35	6-10	Crude	Adena Field—Merino, Colo.	$1,357,000	Approved
Pecos Growers Gas Co.	....	8	Gas	Grandfalls, Texas—Reeves County, Texas	$2,500,000	Has ODM write-off
Petroargentina	370	16	Crude	Newguen—Bahia Blanca, Argentina	$40 million	Planned
Petroleos Mexicanos—Avenue Juarez 94, Mexico, D.F., Mexico	440	20	Gas	Brazil—Tampico—Poza Rica, Mexico	.....	Planned
	260	6, 8	Products	Lagos, Mexico—Guadalajara, Aguascalientes, and Salamanca	.....	Planned
	145	12	Crude	18 de Marzo Field—Monterrey, Mexico	.....	Considered
	72	12	Crude	Poza Rica—Atzacapotzalco, Mexico	.....	Proposed
Phillips Petroleum Co.—Bartlesville, Okla.	52	10	Products	Shell's Brookshire system—Sweeney, Texas	.....	Planned
	54	6	Products	Goldsmith—Borger, Texas	.....	Planned

Continued on Page 96

Pipe Line Contracts Not Let (Continued)

COMPANY	Length in Miles	Diameter	Type	Origin and Terminus	Estimated Cost	Status
Pine Tree Pipe Line Co.	204	8, 10	Gas	Boston area—Bangor, Me.	.....	Planned
Pittsburgh Consolidation Coal Co.	100	....	Coal	Cadiz, Ohio—near Cleveland, Ohio	$10 million	Planned
Powder River Pipe Line Co.—Casper, Wyo.	52	6, 8	Crude	Salt Creek and Casper, Wyo.	.....	Planned
Progress Pacific Pipe Line Co.—530 W. 6th St., Los Angeles, Calif.	1,100	24	Crude	Odessa, Texas—Los Angeles Harbor	.....	Planned
Santos Jundiai Railway Co.—Brazil	....	8, 14, 22	Crude & Products	Expansion of Santos-Sao Paulo system	$4 million	Planned
Shamrock Oil & Gas Corp.—1st National Bank Building, Amarillo, Texas	55	6	Products	McKee—Amarillo, Texas	$1 million	Planned
Shenandoah Gas Co.—Lynchburg, Va.	40	3, 4, 8	Gas	Virginia Gas Transmission Company system—Virginia and West Virginia towns	$1,470,000	Authorized
South Georgia Natural Gas Co.	368	2–12	Gas	Lee County, Alabama—Georgia and Florida	$8,969,429	Authorized
Standard Oil Company of Texas	248	6	Products	El Paso, Texas—Albuquerque, N.M.	$4 million	Planned
Standard Pipe Line Co.	350	16	Crude	Glendive, Mont.—Guernsey, Wyo.	.....	Planned
	330	16	Crude	Wink, Texas—Albuquerque, N.M.	$4 million	Planned
Sturgeon Pipe Lines, Ltd.	100	12	.....	Sturgeon Lake Field—Trans-Mountain system	$6,500,000	Planned
Sunflower Pipe Line, Inc.—Tulsa, Okla.	265	3–6	Products	Western Kansas—Wichita	$3,500,000	Authorized
Tennessee Gas Transmission Co.—Box 2511, Houston 1, Texas	50	10	Gas	Nueces County, Texas	.....	Proposed
	243	24	Gas	Hebron storage field, Pennsylvania—Greenwich, Conn.	.....	Proposed
Texas Eastern Transmission Corp.—Texas Eastern Building, Shreveport, La.	481	16, 24, 26	Gas	Reconvert "Little Big Inch" line and construct 382 miles of additional line	$71,114,000	Proposed
	....	....	Gas	Reynosa, Mexico—Texas Eastern line	.....	Considered
Texas Gas Corp.—Shreveport, La.	3.5	12	Gas	Sabine River crossing to join Transcontinental Gas Pipe Line	.....	Authorized
Texas Gas Transmission Co.—416 W. 3rd St., Owensboro, Ky.	48	26	Gas	Lake Cormorant, Mississippi—Slaughter, Ky.	$4,250,000	Proposed
Trans-Canada Pipe Line, Ltd.—Calgary, Alberta, Canada	2,240	30, 36	Gas	Alberta—Eastern Canada	$297 million	Approved
Transcontinental Gas Pipe Line Corp.—3100 Travis St., Houston 6, Texas	....	....	Gas	Connecting facilities with Texas Eastern—Penn Jersey in Pennsylvania and New Jersey	$131,628	Authorized
	533	30, 36	Gas	Paralleling portions of Texas—New York line	$80 million	Proposed
	25	12	Gas	Cameron and Calcasieu parishes, Louisiana	$1,076,000	Proposed
Trans-Northwest Gas, Inc.	246	....	Gas	Osoyoos, B.C.—Washington and Idaho, plus 275 miles branch lines	.....	Planned
Triangle Pipe Line Co.	560	12	Products	Arkansas City, Ark.—Covington, Ky.	$24,500,000	Proposed
Union Gas Company of Canada, Ltd.—Chatham, Ontario	180	24	Gas	Dawn gas field in Lambton County to deliver gas to Dominion Gas Co.	.....	Planned
Union Oil Company of California—Union Oil Building, 617 W. 7th, Los Angeles 17, Calif.	65	12	Crude	Santa Clara Valley Field—Wilmington refinery	.....	Proposed
United Fuel Gas Co.	13	12, 20	.....	West Virginia	.....	Before FPC
U. S. Army Corps of Engineers	600	....	Products	Under study to supply military bases in Spain	$16 million	Planned
U. S. Navy	450	8	Gas	Gubik Field—Fairbanks, Alaska	$20 million	Proposed
Utah Natural Gas Co.	40	16	Gas	Orem—Salt Lake City, Utah	.....	Planned
Virginia Natural Gas Co.	153	....	Gas	Buckingham—Richmond and Portsmouth, Va.	.....	Planned
West Coast Pipe Line Co.—Mercantile Bank Building, Dallas, Texas	960	24, 26	Crude	Wink, Texas—Norwalk, Calif.	$106 million	Planned
Williston Basin Pipe Line Co.—Insurance Building, Omaha, Neb.	244	8	Products	Billings and Laurel refineries—Glendive, Mont.	.....	Out for bids.
Wyoming Gas Products Corp.	....	....	Gas	Gathering system in Weston County, Wyoming, to feed gasoline plant	.....	Planned
Yacimientos Petroliferos Fiscales Bolivianos	170	4	Crude	Bermejo—Tupisa, Bolivia	.....	Planned

Proficiency in Pipelining

With the combined experience in pipeline construction totaling many centuries, and spanning many sections of America, Houston Contracting Co. performance meets the highest standards of proficiency.

HOUSTON CONTRACTING COMPANY LTD.

General Partners:
Laurence H. Favrot
R. P. Gregory

Associate:
Geo. A. Peterkin

General Contractors

Oil - Gas - Gasoline - Water Pipe Lines

2707 FERNDALE HOUSTON 6, TEXAS

PIPE LINE PROGRESS

Northern Natural achieves billion cu. ft. daily line capacity... builds with A. O. SMITH LINE PIPE

Northern Natural Gas Company this year completes its expanded two-year construction program, with total daily pipe line capacity up to 1,100,000,000 cu. ft. 460 miles of new main line loops were laid in the two-year program, with twelve sections of loop line being laid each year. New line facilities bring natural gas to 71 additional communities in Iowa, Nebraska, Minnesota and South Dakota . . . so that the company now serves a total of 307 communities in the Northern Plains.

A. O. Smith's participation in the job consisted of 178 miles of 30-inch pipe and 60 miles of 20-inch pipe.

Highly regarded in the industry because A. O. Smith welded steel pipe is consistently accurate in size, roundness and end-to-end matchup. A. O. Smith has supplied all or a part of the line pipe for most major pipe lines in the country.

A. O. Smith Line Pipe is available in a complete range of sizes and wall thicknesses, from 8⅝-in. to 36-in. diameters.

The A.O.Smith Casing Mill is operating at capacity to supply vitally needed casing for the Oil and Gas Industry.

Through research ... a better way

A.O.Smith
CORPORATION
TUBULAR PRODUCTS DIVISION
Milwaukee 1, Wisconsin

Chicago 4 • Dallas 2 • Houston 2 • Los Angeles 22 • Midland 5, Texas • New Orleans 12 • New York 17 • Pittsburgh 19 San Francisco 4 • Seattle 1 • Tulsa 3 • Washington 6, D.C.
International Division: Milwaukee 1

For more data on advertised products, use Readers' Service Cards, last page.

PIPE LINE INDUSTRY'S VIEWS OF THE NEWS

HEADLINES OF THE MONTH

• Escape clauses out, says FPC . . . • Statesmanship, diplomacy vital now, declare industry leaders . . . • Oil movement swings to south-north . . . • Union merger sure . . . • Oil taxes top $5 billion . . . • Effect of gas prices on oil stocks argued . . .

'Escape Clauses Out'—FPC

The Federal Power Commission is ready to clamp down on any gas company which tries to evade commission jurisdiction by invoking "escape clauses" in sales contracts to terminate service.

Nearly all long-term gas contracts contain a provision under which the gas seller reserves the right to shut off sales in event the FPC or kindred authority should impose regulations on production, gathering, processing, or sale of natural gas.

The clause has become a bone of legal contention since the Supreme Court's historic decision June 7 in the Phillips Petroleum Company case holding that the FPC must take jurisdiction over, and fix prices on, all gas sold in interstate commerce.

Asked if the Commission would sanction such provisions, in view of the Court's decision, an FPC lawyer (who wished to remain anonymous) returned an emphatic "No!"

"No company has the right to terminate a contract without FPC approval," he added. "All of them are governed by the Natural Gas Act of 1938, and subject to the latest Supreme Court interpretation in the Phillips case."

He said that so far, no test cases have been filed, but if any are, the commission is ready to challenge them and will do so swiftly.

The issue was to come up for considerable discussion late last month when the commission received briefs and heard oral arguments on petitions for a rehearing of its controversial order 174-A. The order—growing out of the Phillips decree—requires independent producers to obtain certificates of necessity to operate and also subjects all their contracts, regardless of price escalator or escape clauses, to FPC approval.

A commission spokesman predicted that the FPC would stand its ground. In this connection he cited the Commission's Sept. 8 statement fixing the dates for filing briefs and hearing oral arguments. At that time the commission denied all requests for a stay of order 174-A, as "without reasonable justification."

This meant it will press ahead with enforcement of the order until such time as the petitioners—or perhaps the Supreme Court—can change its mind.

The spokesman was not in a position to say what might be the outgrowth of the burgeoning dispute. When the Sept. 6 filing deadline had passed, about 100 petitions had been filed.

The FPC itself would like to get out from under the court's edict because it regards its jurisdiction over natural gas at the well head as an invasion of state's rights. But it is equally determined to enforce the decree so long as it is on the books.

A bevy of oil and gas state senators, headed by Senate Democratic Leader Lyndon B. Johnson of Texas, are ready for an attempt to cancel the court's ruling with a new law, should it still be standing when the 84th Congress convenes in January.

TGT Drops Rate Hike Plea

The FPC's gas price freeze caused Tennessee Gas Transmission Company last month to drop its application for a $13.6 million annual increase in wholesale rates.

TGT's whole case hinged on expected increase this fall in the prices charged by independent producers. Tennessee had filed its rate boost application April 30. The FPC rate freeze order was announced July 16, with minor modifications on August 6.

In return for TGT abandonment of its rate increase application, FPC attorneys agreed not to complain about the company's present rates. FPC lawyers had contended that the company's present rates are about $3,750,000 too high.

Statesmanship Vital Now

Greater advancement has come with the petroleum age than in any other era. Providence and Nature stored oil in the ground; daring curiosity of man eventually found it; progress born of it has served to develop it. Yet, the unmatched perversity of man has led the petroleum industry into a dangerous position.

One answer to at least part of the problem at hand, previously pointed to by industrial leaders, and underscored by Gen. Ernest O. Thompson, Texas Railroad Commission chairman, at the recent annual meeting of the National Petroleum Association in Atlantic City, is a combination of statesmanship and diplomacy.

They are the routes deemed best by industry leaders to offset the serious problems of:

• Renewed efforts to eliminate or reduce depletion allowance.

• Federal control through the Phillips case decision.

Senator Lyndon Johnson of Texas, Senate minority leader, made his views clear in an address before the Mid-Continent Oil and Gas Association's recent Houston meeting: "There is an immediate need to explain the oil industry to the public because an old issue is about to rise in a new and dangerous form. It is the drive to repeal or lower the oil depletion allowance."

J. Sayles Leach, chairman of the board, The Texas Company, forecast a blunt warning: Tampering with depletion allowance would be suicidal since its effect would be to abolish incentive to hunt for new oil sources at a time when such sources are urgently required.

Gen. Thompson said "when the public once learns that the 27½ percent depletion recognition in the tax laws causes additional wells to be drilled in search for new oil, and that eight out of nine of these exploratory wells are dry, then the Congress will be called blessed and wise in having seen the need for this incentive."

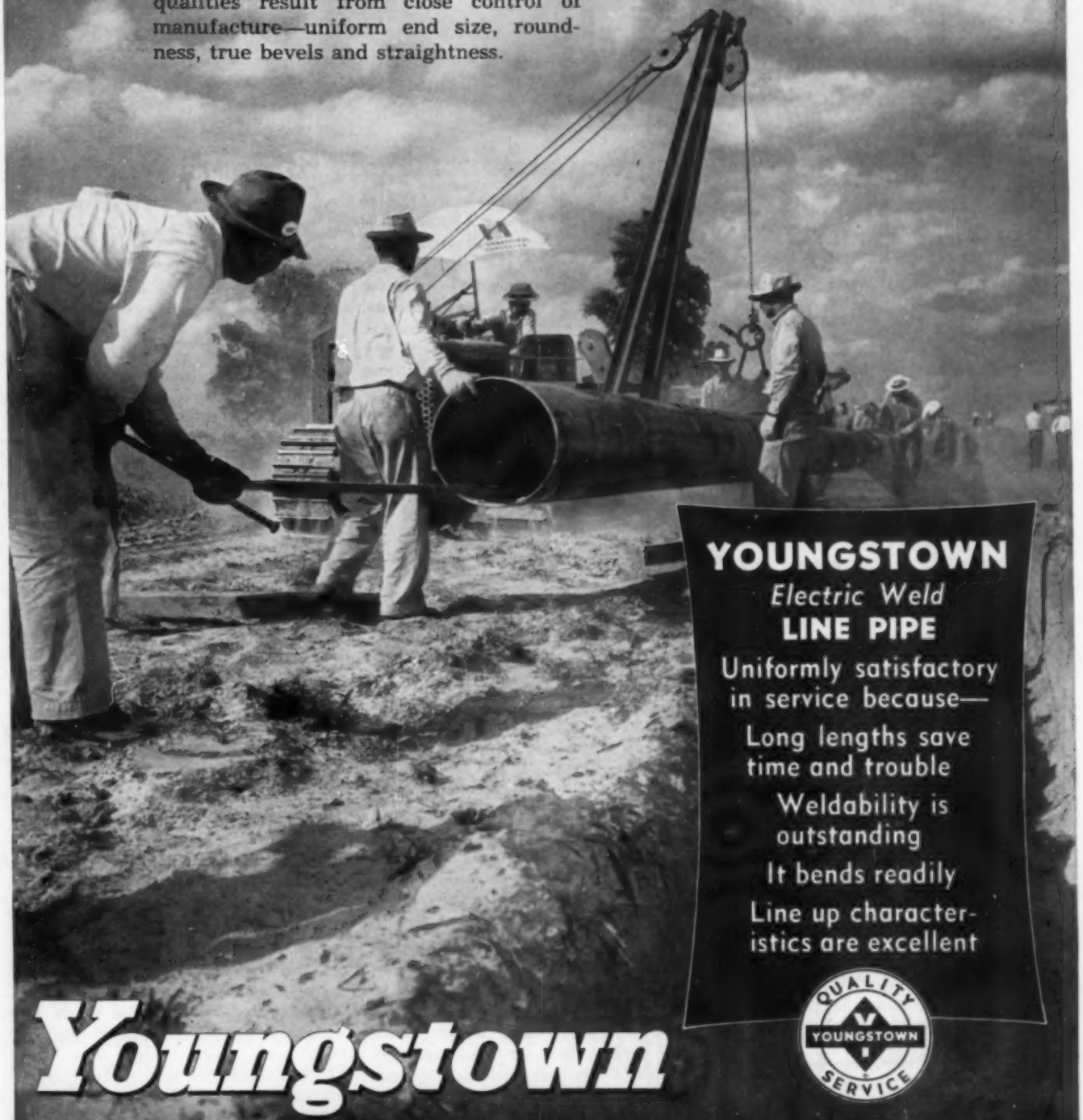
The public should be alerted to the continuing need for new oil discoveries. The oil industry has pointed to this need intermittently. But if the layman wants it officially, he has it, too.

Wrote R. B. Anderson, new deputy Secretary of Defense, on May 22, 1953, when he was Secretary of the Navy: "This figure (the then current U. S. daily proliquids of 7,059,000 barrels) is not sufficient to meet . . . requirements in . . . a national emergency."

" . . . Reliance must be placed on the drilling of new wells and developing of areas heretofore not fully developed rather than putting all our faith in proven reserves . . ."

Yes, it's Youngstown

IT'S NO ACCIDENT that Youngstown joints line up so well, thus speeding up pipe laying and welding. Good line-up qualities result from close control of manufacture—uniform end size, roundness, true bevels and straightness.



YOUNGSTOWN
Electric Weld
LINE PIPE
Uniformly satisfactory in service because—
Long lengths save time and trouble
Weldability is outstanding
It bends readily
Line up characteristics are excellent

QUALITY Y YOUNGSTOWN SERVICE

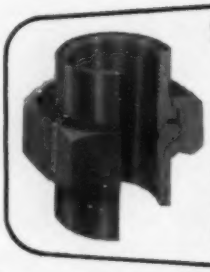
Youngstown

THE YOUNGSTOWN SHEET AND TUBE COMPANY
Manufacturers of Carbon, Alloy and Yoloy Steel
General Offices: Youngstown, Ohio - Export Office: 500 Fifth Avenue, New York 36, N. Y.
PIPE AND TUBULAR PRODUCTS - CONDUIT - BARS - RODS - COLD FINISHED CARBON AND ALLOY BARS - SHEETS - PLATES - WIRE - ELECTROLYTIC TIN PLATE - COKE TIN PLATE - RAILROAD TRACK SPIKES

Catawissa
PERFECT SEAL
Unions

HOT FORGED from solid, rectangular steel bars, designed and produced for dependable, long-life service under the severest piping conditions!

A TYPE FOR EVERY USE!
FOR ALL PRESSURES!
FOR ALL TEMPERATURES!



Standard & Double Extra Heavy
UNIONS
Available with screwed or socket weld ends. 3000-lb. sizes 1/8" to 3"; 6000-lb. sizes 1/8" to 2".

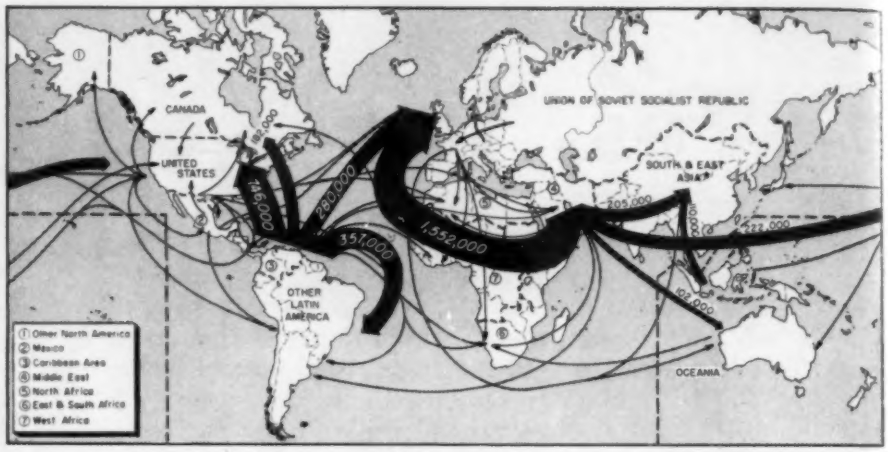
ORIFICE UNIONS
With screwed or socket weld ends. 3000-lb. and 6000-lb. service.

MALE & FEMALE UNIONS
With steel-to-steel, bronze-to-steel, stainless steel-to-steel or orifice seats. 3000-lb. service only.

Standard & Double Extra Heavy
LUG NUT UNIONS
Hammer-type for quick opening and quick closing.

WRITE FOR CATALOG 11
showing the complete Catawissa line of Perfect Seal Products

CATAWISSA VALVE AND FITTINGS COMPANY
60 Mill St. · CATAWISSA, PA.



All movements indicated are barrels 42's daily. —Standard Oil Company (N. J.) map
*Excluding Soviet-dominated areas.

Oil Movement Swings to South-North

World oil movement, which prior to World War II was primarily from West to East, is now more nearly from South to North, largely from the Middle East to Europe and a growing volume from the Caribbean area to the U. S. and Canada. Due to the proximity of large-volume Middle East crude production to the greatly-expanded European refineries and the fact that supplementing U. S. domestic production with reasonable imports is desirable, there is little likelihood that the present pattern will change.

This is a summary of the remarks by Chester F. Smith, vice president and a director of Standard Oil Company (N. J.) at the annual meeting of the National Petroleum Association at Atlantic City in mid-September. Figures cited by Smith showed that Europe in 1938, with 300,000 barrels daily of refining capacity, depended on the U. S. and the Caribbean for 61 percent of its petroleum requirements. In 1953, Europe's refinery capacity had expanded 400 percent to 1,820,000 barrels daily, or to a level of near self-sufficiency in products, and the area received 78 percent of its petroleum needs from the Middle East.

Such a change in the international flow pattern, the Jersey Standard official stated, was logical because of the world currency situation since the war and the rapid development of Middle East oil production. While Middle East oil development was stimulated by the war, Europe's switch to that area as its major source of crude petroleum would have occurred regardless of a war because of the shorter tanker distance and the important part played in Middle East production by British and Dutch companies willing to accept soft European currencies in payment for oil.

Another significant development in international petroleum trade in the postwar years cited by Smith has been the erection of refinery capacity near the major consuming areas rather than near the large producing and export centers as was the pre-war practice. This, too, grew out of the currency situation since it is a saving in foreign exchange for consuming nations to import crude rather than finished products, he noted.

While the growth in refinery capacity has been most significant in Europe, total refining capacity expansion in the free world outside the U. S. has amounted to 127 percent since the war, or from 2.6 million to 5,908,000 barrels a day, it was stated. Smith estimated that in about three years when refineries now under construction or proposed are completed and with the Abadan plant in Iran operating at about 250,000 barrels daily, the free world's refinery capacity outside the U. S. will total almost 7 million barrels daily. By comparison, Smith said U. S. refining capacity at that time will be about 9,125,000 barrels a day.

Union Merger Is Certainty

The iron hand of CIO President Walter Reuther, plus a few Reutherian threats, have made merger of the CIO's oil and chemical workers unions a certainty.

Elwood Swisher's United Gas, Coke and Chemical Workers approved the merger last month at their St. Louis convention, but not until Reuther said some harsh words which added up to an ultimatum.

Merge, he told rebellious delegates, or go your own way, without CIO financial or organizing support. His words were addressed primarily to West Virginia and Ohio locals which charged that O. A. (Jack) Knight's Oil Workers International was out to swallow up the UGCCW.

The merger was approved on a roll call vote of 667 to 192 after the rebels refused to make it unanimous.

Knight and Swisher called Reuther into the breach when the revolt threatened to

get out of hand. The CIO president talked "cold turkey."

He said bluntly that neither union was strong enough to organize more than the fringe of their industries but that, together and backed by the CIO's exchequer and organizers, they could become one of the most powerful in the nation.

"Acting independently, you cannot raise the money to take on a big company," he said, "but the CIO can. But bear in mind, unless there is a merger the CIO will spend its money as it sees fit."

The vote of approval followed. All the combine needs now is approval by Knight's union, which will come at a cut-and-dried meeting in Cleveland Nov. 15, and a joint organization convention to be held by January 1.

Officers of the two unions will meet soon to work out details of the convention.

The combine will bring into being a 200,000-man union under which Reuther, Knight and Swisher hope to unify 1 million American and Canadian oil and chemical workers in a force strong enough to dominate the industries.

In the hot words hurled at St. Louis, Knight denied he regarded the chemical workers as merely a "ripe plum" waiting to be plucked. He pledged the merger would be carried out "on equal terms" and that officers would be elected on a fair basis at the joint convention.

Swisher echoed these words but it took Reuther to pound them home.

No. 1 rebel was Andrew Bragg of UGCCW local 420, West Virginia. He pointed out that the oil and chemical workers have bitter jurisdictional differences, and added: "Reuther says: 'If you don't vote to please me, I'll cut your water off,' and I say to Brother Reuther: 'Brother, I'll just dig another well.' "

Another opponent was Director Robert Buchanan of District 5, Ohio and West Virginia. He said other CIO unions "have been watching our progress for the time when they could pick up one of the richest plums."

Reuther hailed the vote as the "first step" toward the 1 million-man union—a campaign which Knight originated. This union would embrace 30 CIO, AFL and independent organizations, most of which have been cold toward the movement but are now expected to display more interest.

Knight Keeps Powder Dry

The Oil Workers International Union was still clinging to its "unloaded gun" policy in wage negotiations last month, but President O. A. Knight seemed to be reaching for the ammunition.

Under the headline, "Companies Spurn

STOPS WEEDS

Wherever ground must be kept bare of fire-hazardous weeds and grasses... use BORASCU... the modern, low-cost weed killer! Ease of application and effective results make BORASCU a very wise choice for the long-lasting destruction of unwanted vegetation about your tank batteries, well sites and heater units, etc. Weeds *can't* grow on ground that has been properly treated with BORASCU. Nor do you need special equipment... just a man, a pail, and BORASCU.

CONCENTRATED BORASCU WEED KILLER

- NOTHING TO MIX
- NO WATER TO HAUL
- NONCORROSIVE TO FERROUS METALS
- NONPOISONOUS
- NONSELECTIVE

Kills weeds for pennies

Saves you Dollars

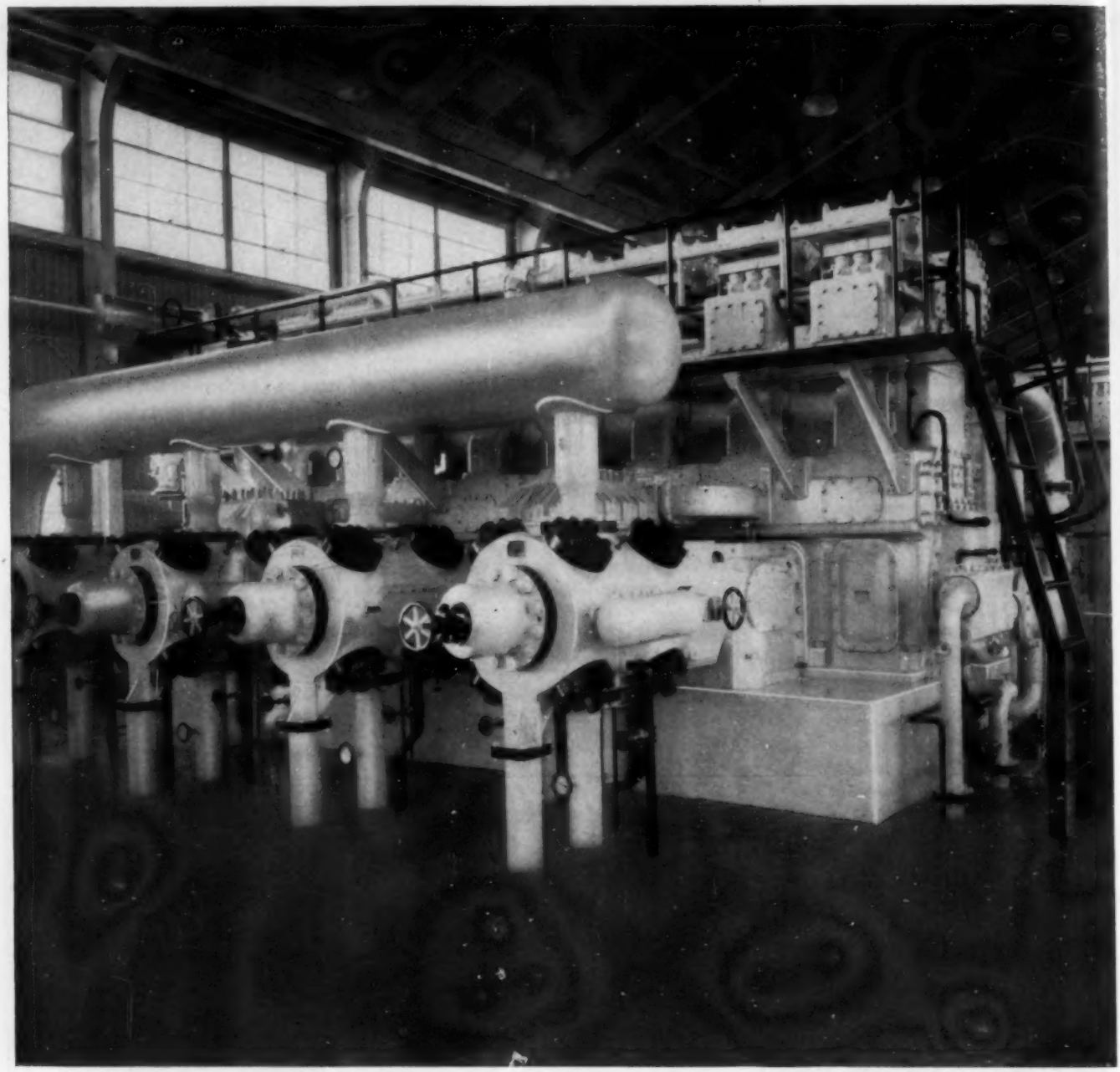
PACIFIC COAST BORAX CO.

DIVISION OF BORAX CONSOLIDATED, LIMITED

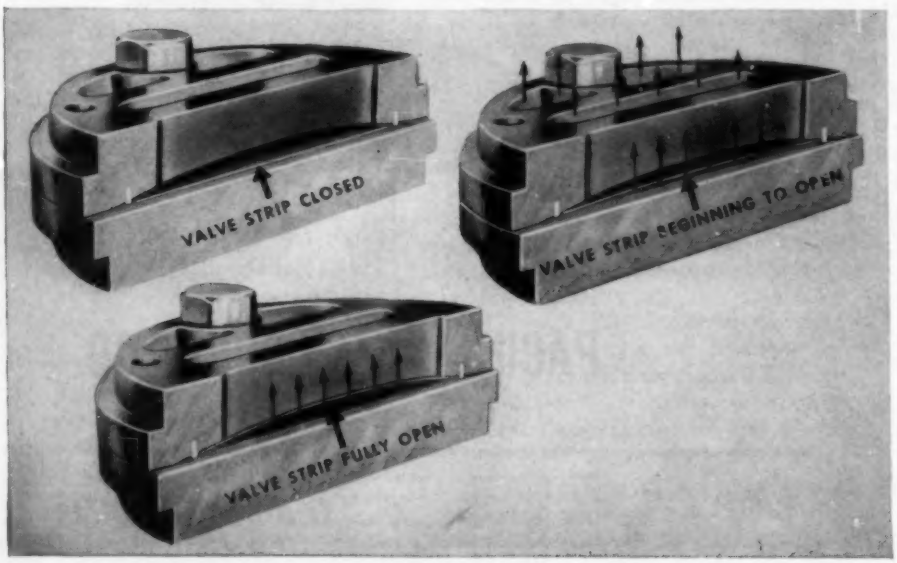
Sales Offices

Weed Control Representatives located in: AMARILLO, FT. WORTH and HOUSTON, TEX. • AUBURN, ALA. • NEW YORK CITY • PHILADELPHIA • CHICAGO • CLEVELAND • DENVER KANSAS CITY, MO. • MINNEAPOLIS, MINN. • POCATELLO, IDAHO • PORTLAND, ORE. SAN FRANCISCO Home Office: 630 SHATTO PLACE, LOS ANGELES 5, CALIFORNIA

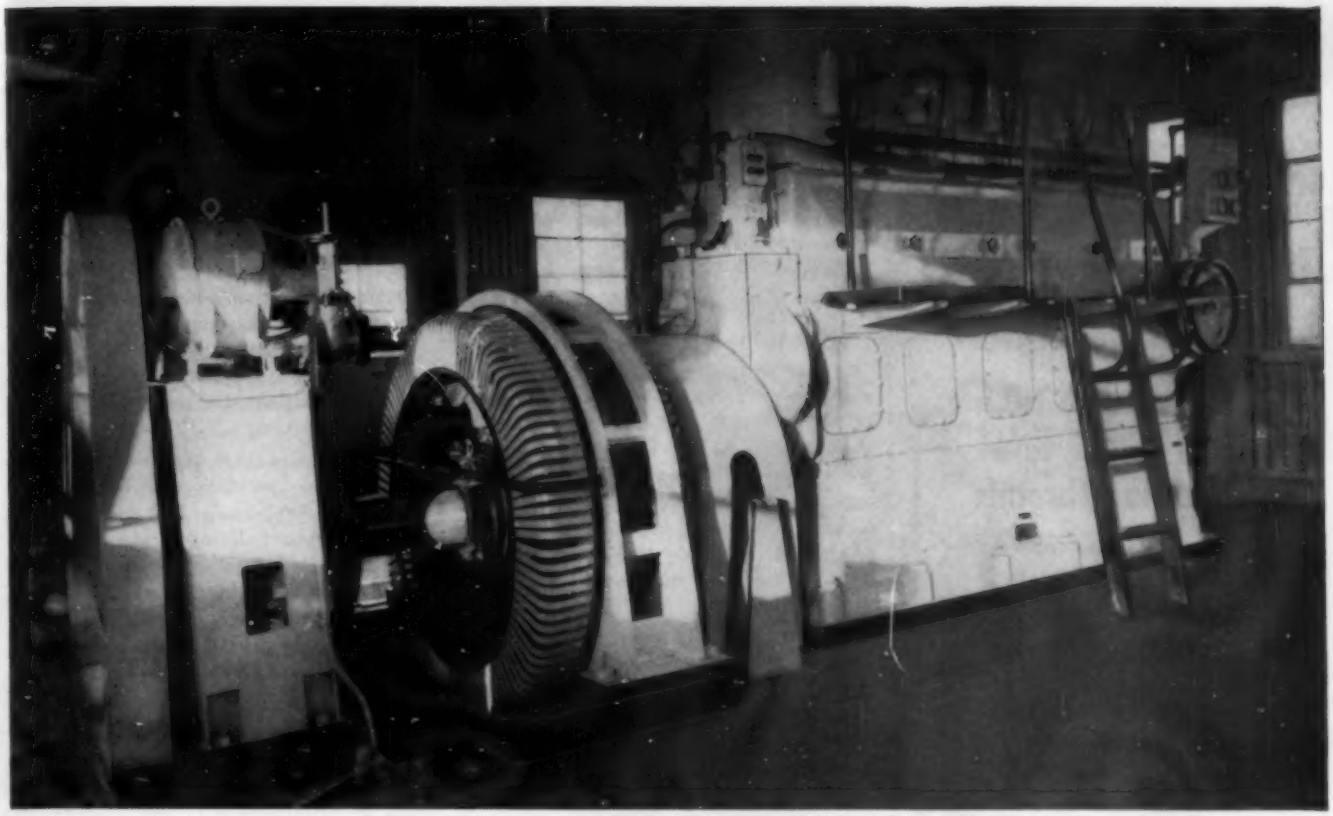
For more data on advertised products, use Readers' Service Cards, last page.



ONE OF FIVE MODERN WORTHINGTON UTC ENGINE-COMPRESSORS at the United Gas Pipe Line Company's McComb, Mississippi, compressor station. McComb is one of the key installations on a new 30″ line that carries gas from Louisiana fields and underwater wells in the Gulf of Mexico, north to Jackson and Kosciusko, Miss. Gas is delivered to McComb at 727 psig, and the Worthington UTC's discharge the gas 68 miles north to Jackson and another 58 miles north to Kosciusko.



THE QUIET-OPERATING WORTHINGTON FEATHER VALVE, standard equipment on all Worthington compressors, is made up of a series of thin flexible strips of ribbon steel, held in position over rectangular openings by curved milled guards. In addition to providing quiet operation, the absence of impact results in long valve life and low maintenance costs.



McCOMB STATION IS MADE SELF-SUFFICIENT by this CCG-5 Worthington natural gas engine, which supplies electric power for safety system solenoids and other emergency requirements if normal power supply fails.

Sound plant design pays off in new United Gas Pipe Line Company's compressor station

• First new compressor station to go into service in United Gas' three-year $250,000,000 expansion program is the McComb, Mississippi, plant, where five 1600-hp Worthington UTC engine-compressors are in operation, designed to handle 470,000,000 cubic ft. of gas per day. End result of this expansion will be to make United Gas the first company in the world capable of handling a trillion cubic feet of gas per hour.

The benefits of good plant design and proper operation are evident at the McComb Station. Since April 3, 1952, when the Worthington UTC's were started up, the station has been remarkably free of "bugs"; there has not been a single shut-down because of engine failure.

Contributing largely to this fine record have been the time-tested features of the Worthington UTC's. For example, every Worthington compressor is equipped with the exclusive Feather* Valve — the lightest, tightest, most efficient valve available. Records show that Worthington Feather Valves have materially reduced power costs.

While Worthington UTC compressors are widely used for pipeline gas compression, they are also well suited to many other jobs, such as pressure maintenance on oil wells; varied service in natural gasoline plants; solvent extraction, vapor recovery, and recycling and stabilization of gases in oil refineries.

If your business requires gas compression, it will pay you to write for further information on the Worthington UTC Engine-Compressor. Sizes range from 1,000 to 2,000 hp. Write directly to Worthington Corporation, Engine Division, Buffalo, New York, for Bulletin S-500-B23B.

**Reg.U.S.Pat.Off.* EK.3.4

WORTHINGTON

ONLY WORTHINGTON COMPRESSORS GIVE YOU FEATHER VALVE PERFORMANCE

Y-Types • Engine-Starting • Horizontal • Portable • Radial • Gas Engine

JET-LUBE

KOPR-KOTE

(U.S. Pat. No. 2,543,741)

THREAD LUBRICANT AND SEAL

for Casing and Tubing, Drill Collar and Tool Joint Threads

- for precision cut threads
- perfect seal, prevents washouts
- anti-seize, prevents galling
- full makeup, easy breakout
- withstands high pressure & temperature
- perfect thread and shoulder contact
- will not pack or work harden
- perfect matrix for damming
- will not separate
- corrosion and rust inhibitor

Contains pure metallic lead and copper flake.

JET-LUBE

APPLICATOR

For applying lubricants faster without hand brushing. Prevents lube contamination. Reduces consumption. Insures clean lube. Saves time, equipment.

Order from your supply house or send for Technical Bulletin

JET-LUBE INC.

3093 No. California St., Burbank, Calif.

Export Office

30 Rockefeller Plaza, New York 20, N. Y.

Canadian Licensee

Jet-Lube of Canada Ltd., Edmonton, Alberta

OWIU's Peaceful Wage Campaign," the official OWIU publication last month declared that "Companies with few minor exceptions . . . have refused to grant wage increases or even to discuss seriously the matter of wage increases."

The article recalled that the OWIU Policy Committee last June pledged the union would not strike, threaten to strike, or take strike votes in support of wage requests.

President Knight was quoted as saying: "We are becoming more and more convinced that reasonable, logical discussion of facts will not convince management of the justification of wage increases. We would have felt somewhat better about our experiment (the unloaded gun policy) if some of the major companies had actually engaged in full-scale and detailed discussions of the wage question with us, even if those discussions had not resulted in increases."

The OWIU will continue to negotiate on an "unloaded gun" basis, Knight added, "unless and until the Policy Committee or international convention changes policy. . . . I have no doubt the Policy Committee will carefully review policy when it meets in connection with the Nov. 15 international convention."

Oil Taxes Top $5 Billion

It is not unusual for an oil company to pay more in taxes than in dividends.

It is not unusual for taxes to exceed payrolls.

This is the situation which has caused the API to stamp on some of its stationery this slogan: "With such a tax on gasoline, why not call it Taxoline."

Taxes on gasoline and other petroleum products have jumped to almost $5 billion a year, according to the API's tax economic bulletin. Federal, state and local taxes on petroleum products have mounted from $1 billion in 1933 to $4.9 billion in 1953, or nearly five-fold. The 1954 total will be higher.

Here is what some companies cited by the API said in their stockholder reports:

Cities Service Oil Company—"Gasoline now carries a tax equal to 35 percent of the average retail price. . . . The end is not in sight."

Esso Standard Oil Company—"In 1953 Esso paid federal, state and local governments $301,700,000 in taxes—$6 for every barrel sold."

Lion Oil Company—"Gasoline taxes added up to more money than was collected by all states from all tax revenue sources in any fiscal year up to 1936."

Sun Oil Company—"The bill on gasoline has risen to spectacular heights. The continuation of the federal tax is especially to be deplored."

Chances of immediate relief are dim. Gasoline taxes, amounting to about $3 billion per year, are the topic of a dispute between President Eisenhower and the National governors conference, could be a major issue in the next Congress.

The governors want the government to get out of the gasoline tax field. The President is determined to stand pat until the federal budget is in the black. He opposed all attempts to tamper with the levy this year, but did appoint an Inter-governmental Relations Committee which will report next year.

There is also some question whether the gasoline tax problem can be separated from the President's $50 billion, long-range highway building program. Gasoline taxes are the federal government's method of highway financing.

GSA, Producers at Odds

General Services Administration, the government's purchasing agency, is embroiled with independent oil producers and Democratic Congressman John Jarman of Oklahoma over purchases of foreign oil for the military under the "Buy American" Act.

The wrangle stemmed from a GSA ruling at Dallas, Texas, couched in unfortunate language. The GSA agency said, essentially, that crude products are exempt from the act because the domestic crude supply is insufficient. Domestic producers, who have long fought oil imports, took exception to the ruling.

Representative Jarman insisted in a sharp letter to GSA Chief Edmund F. Mansure that the government should not buy oil abroad "when there is a more than adequate supply at home."

Mansure replied, in effect, that he was caught in the middle of a dispute between independents and the National Oil Jobbers Council, representing 12,000 to 15,000 members. He said the Council demands that the act be waived because its members are unable to pedigree the oil they sell as either foreign or domestic.

Gas Pricing Argued

That the price of natural gas is too low cannot be argued in the light of its Btu value.

But just how much effect this underpricing of natural gas has on present excess petroleum stocks is a matter that can be, and is being, argued stoutly.

It has been reported that Interior Department officials are showing Congressmen charts which attribute the plight of

domestic oil producers to the growth of natural gas rather than oil imports.

Another on that side of the debate is T. S. Petersen, able and articulate president of Standard Oil Company of California.

In a letter to Chairman Ernest O. Thompson of the Texas Railroad Commission, Petersen maintained: "Marked success of natural gas in competing with petroleum has been largely due to its extremely low by-product value. In early years of growth in marketing natural gas, its field price amounted to only two or three pennies per mcf, far below its inherent Btu value related to prices for crude oil.

"The field price of natural gas in Texas is now in the neighborhood of 10 cents per mcf. This in terms of the equivalent crude oil value is about 60 cents, compared to a posted price of light crude oil of approximately $3 per barrel.

"This leads to the thought that royalties paid to landowners are inordinately low, and in no sense compensates them for the true value of the natural gas being produced.

"Until such time as field prices for gas have come into closer balance with real values paid to producers of crude oil, property and royalty owners can continue to expect meager returns and crude oil will suffer still further inroads in its markets."

Telling the Story of Oil

Few Americans will be able to avoid seeing or hearing of the importance of the American oil industry during the week of October 10-16 when producers, refiners, transporters and marketers of petroleum celebrate the seventh annual Oil Progress Week.

The story of the industry, using the theme, "Oil Serves You," will be brought to the public in almost every community through the cooperative effort of thousands of competing American oil companies under the sponsorship of the American Petroleum Institute and directed by the Oil Industry Information Committee. All known methods of communication will be employed to tell the industry's story, ranging from speeches and movies to fashion shows and visits to petroleum installations.

One highlight of Oil Progress Week will be the premiere in many cities of the OIIC's sixth motion picture, a color film entitled "The Story of Colonel Drake." After its Oil Progress Week showing, the new film will commence a tour of most every U. S. town.

Petroleum's story will be presented to the schools, and in many communities high school students will participate in "Oil Man for a Day" programs. The students will visit local petroleum installations and will "work" in the wide range of oil industry jobs.

Lightweight Vise that's also a Work Bench... it's

RIDGID

Tristand

...with built-in folding tray

Stand and tray are all one unit—no loose parts. Quick easy set-up and take down. Extra-light weight but strong, rigid. Full size vise base—3 benders, ceiling brace screw, pipe rest, lots of tool slots. An unbeatable value—see it at your Supply House!

Tray pushes up easily to fold Tristand, pushes down easily to set up. Holds stand rigid.

Folds up for easy carrying to job and it's extra lightweight.

The Ridge Tool Company • Elyria, Ohio, U. S. A.

RIDGID

Work-Saver Pipe Tools

For more data on advertised products, use Readers' Service Cards, last page.

Pipe Line Men

IN THE NEWS

Henry Hofmann has been named assistant to the president of **Tuscarora Pipe Line Company, Ltd.** Hofmann, who joined Tuscarora more than 35 years ago, was formerly secretary-treasurer and a manager of the company.

E. L. Ochs will take over Hofmann's former duties, and **G. Warren Miller,** presently assistant treasurer, will become assistant secretary-treasurer. **John W. de Groot** is president of Tuscarora.

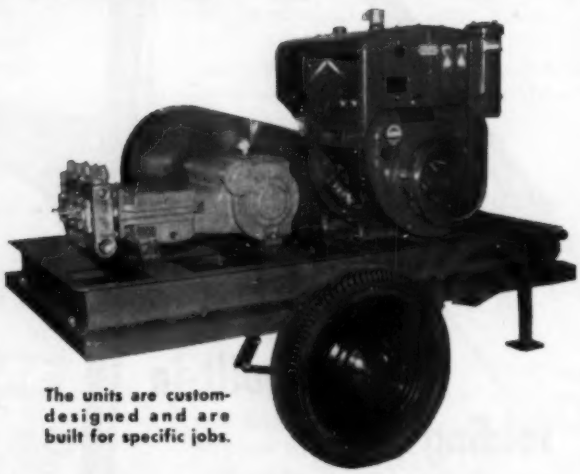
CONCENTRATED EXPERIENCE

over the years has eliminated all weak links on the HARLEY Units powered with

WISCONSIN

Air-Cooled Heavy Duty Engines

Practical HARLEY experience over a long period of time



The units are custom-designed and are built for specific jobs.

THE BEST PUMP, COMPRESSOR, GENERATOR OR ACCESSORY

for the job

For any job in the range 3 to 36 H.P.

These units are sold on a money-back guarantee — The operator must be satisfied.

Built by

The HARLEY Units you need can probably be shipped from stock.

HARLEY SALES CO.

HOUSTON TULSA WICHITA

Ray L. Hamilton has been elected vice president of Bechtel Corporation. Since 1953, he has been a vice president of Bechtel International Corp., and Canadian Bechtel Ltd.

R. L. Hamilton

Hamilton, an engineering graduate of Stanford University, had a key role in such pipe line construction projects as Lakehead's line from Superior, Wis., to Sarnia, Ontario, the 1168-mile Trans-Arabian line, and the 718-mile Trans Mountain line in Canada.

•

Damon Holditch is new South Texas district manager for **Lone Star Gas Company** and its wholly-owned subsidiary, Lone Star Producing Company. **Ronald F. Crawford** has been named Oklahoma district manager, and **C. J. (Jim) Harrison** succeeds Crawford as district production engineer for East-Central Texas.

In Lone Star's Purchasing department, **E. L. Harpold** was recently made supervisor of stores, and **Arthur L. Williams,** assistant supervisor of stores.

•

Russell J. Judah has been made compressor department division engineer for **Transcontinental Gas Pipe Line Corporation** at Atlanta, Ga. He was formerly a junior engineer in the compressor department at Transcontinental's home office in Houston.

•

New Western Division clerk for **Magnolia Pipe Line Company** in Midland is **Shuman Childress,** formerly district clerk in Alice. **M. L. Butler,** whom he succeeds, has been transferred to Oklahoma City as clerk for the company's Northern Division.

L. C. Knight, formerly the company's division clerk in Oklahoma City, was transferred to Little Rock, Ark., as clerk there, and **Charles Bradley** of Little Rock is now district clerk in Alice.

O. F. Moore

J. R. Donnell

O. F. Moore, a veteran of 45 years with **Ohio Oil Company,** retired in September and was succeeded as head of supply and transportation activities by **John R. Donnell.**

Moore went to work for Ohio Oil in 1909 as a stenographer. After numerous advancements in the company, he became manager of the pipe line department in 1946 and was elected a vice president and director. On January 1 of this year he became head of a newly-created department embracing the company's operations in the transportation and supply of crude oil and refined products. He is a former member of the API's board of directors.

Donnell joined Ohio Oil in 1936 and became treasurer of the company in 1950. In the past year he has served as assistant manager of the supply and transportation department. He is also a director of **Platte Pipe Line Company.**

Oakah L. Jones of Tulsa, district manager for **Oklahoma Natural Gas Company** for the past 15 years, is new general manager of the **Consumers Gas Company,** with headquarters in Toronto, Canada. In Tulsa, Jones was president of the Chamber of Commerce.

•

Gas measurements functions of the **Natural Gas Pipe Line Company** of America have been consolidated into a division, with **Clark H. Duncan** as superintendent. Headquarters will be Joliet, Ill.

•

D. G. Waldon has been appointed treasurer of **Interprovincial Pipe Line Company** to succeed **D. W. McGibbon,** who resigned recently. Waldon joined Interprovincial in 1950 and has been assistant treasurer since 1953.

•

William F. (Bill) DeLaney has retired as group leader in the accounting department of **Service Pipe Line Company,** Tulsa, after 32 years of service. His successor is **Joe L. Fessner.**

•

A new supply and transportation department of **Standard Oil Company (Indiana)** became operative

the WRENCH we made for YOU

Lowell #50-A Reversible Ratchet Wrench

for speedy installation of pipe line mechanical joints.

Reversible ratchet allows fastest possible tightening of 5/8" hex bolts —special 8" handle assures correct torque, as suggested in American Standard Specifications.

Ask your local industrial distributor for the #50-A Wrench by *Lowell*—makers of industrial wrenches for more than 85 years

or write direct to

LOWELL WRENCH CO.
WORCESTER 8, MASS.

Gotkool water cans and coolers

GOTKOOL WATER CAN
Made in 1½, 2, 3, 5, 10, 15 and 20 gallon sizes. Push-Button Faucet at slight additional cost.

KEEP PURE DRINKING WATER ALWAYS HANDY

GOTKOOL WATER COOLER
Made in 2, 3, 5, 8, 10, 15 and 20 gallon sizes with Push-Button Faucet.

GOTT Water Coolers are the convenient way to keep drinking water handy to the worker, protect it from impurities. Their exclusive construction keeps water cool for long periods. Snug-fitting, large, removable top, handy non-leaking push-button faucet. GOTT Water Cans for handy field use. Your supply store has them, get one today!

STANDARD OF THE OIL FIELDS
Insist on the Genuine

H. P. GOTT MFG. CO.
WINFIELD, KANSAS

For more data on advertised products, use Readers' Service Cards, last page.

See Composite and Refinery Catalogs, or Write for Specifications Folder

FLEET-LINE

PIPE SADDLES AND REDUCERS

Nozzle sizes from ¼" to 24"

ASTM A234

Also for pressure vessel heads

Nominal pipe sizes 1" to 30"

Special sizes and lengths. Schedules 10 to 160

ASA B16.9
ASTM A234

Immediate Delivery

STEEL FORGINGS, Inc.

P. O. Box 276K • Shreveport, La.

Foot of Fannin Street

NEW! Write for Bulletin.

Patented

PIPELINE VENTS AND MARKERS

FLEET-LINE CO.

P. O. BOX 276K

SHREVEPORT, LOUISIANA

GUNITE COATINGS for PIPE LINES

Reinforced GUNITE COATING being applied to pipe.

Your inquiry solicited.

GUNITE CONCRETE & CONST. CO.

1301 WOODSWETHER RD., KANSAS CITY, MO.
2036 ADDISON, HOUSTON, TEXAS
CHICAGO — ST. LOUIS — DENVER
MINNEAPOLIS — NEW ORLEANS

September 1. **Dr. Robert C. Gunness,** formerly assistant general manager of manufacturing, is general manager.

The new department combines purchasing, traffic, and distribution economics operations. It also takes over products pipe line, marine, and distribution terminal functions.

J. W. Boatwright is assistant general manager in charge of distribution economics. **D. S. Warning** is under Boatwright as manager of the department.

Assistant general manager in charge of purchasing is **D. A. Monro,** with **W. H. Scott** reporting to him as manager of the department.

R. E. Nelson Jr., is assistant general manager in charge of operations. **S. L. Jackson,** manager of the products pipe line department, and **D. V. Hartzell,** manager of the marine department, will assist Nelson.

L. R. Cowles is traffic manager.

•

The resignation of **Hill Sanders** as vice president and general manager of Sun Pipe Line Company, crude lines department, to become president of **Mid-Valley Pipeline Company** has been announced. **James E. Ford** will succeed Sanders.

E. F. Morrill, formerly Mid-Valley president, has resigned to become head of the new Petrochemical division of **Standard Oil Company of Ohio.**

Charles Pinkner will take over Ford's work as division superintendent of the Product Lines department. **James Neill Fuquay** has become Sun Pipe Line's superintendent for the Southwest area to succeed Pinkner.

J. Thurman Green, former director of safety for **Sun Oil Company's** production department, has been named to organize and conduct a safety program for Sun Pipe Line's crude lines department.

Erratum

PIPE LINE INDUSTRY unintentionally omitted the source of R. J. Lind's article, "How an Earthquake Affects a Pipe Line," which appeared on Page 56 of the August issue. The article was prepared for and presented at a meeting of the Pacific Coast Gas Association, May 12-13, in San Francisco.

OVER 100 GPH FOR EACH POUND OF PUMP

YET THIS *FLOMAX-15* IS MADE OF TOUGH IRON FOR LONG LIFE

EASY TO HANDLE——WEIGHS LESS——COSTS LESS

FLOMAX Super Hard Seals provide longer trouble-free pump life without nuisance of filling grease cups or fear of dirty grease.

FLOMAX Open Adaptor construction protects your engine from stray pumpage. Also provides plenty of room to work and see when servicing pump.

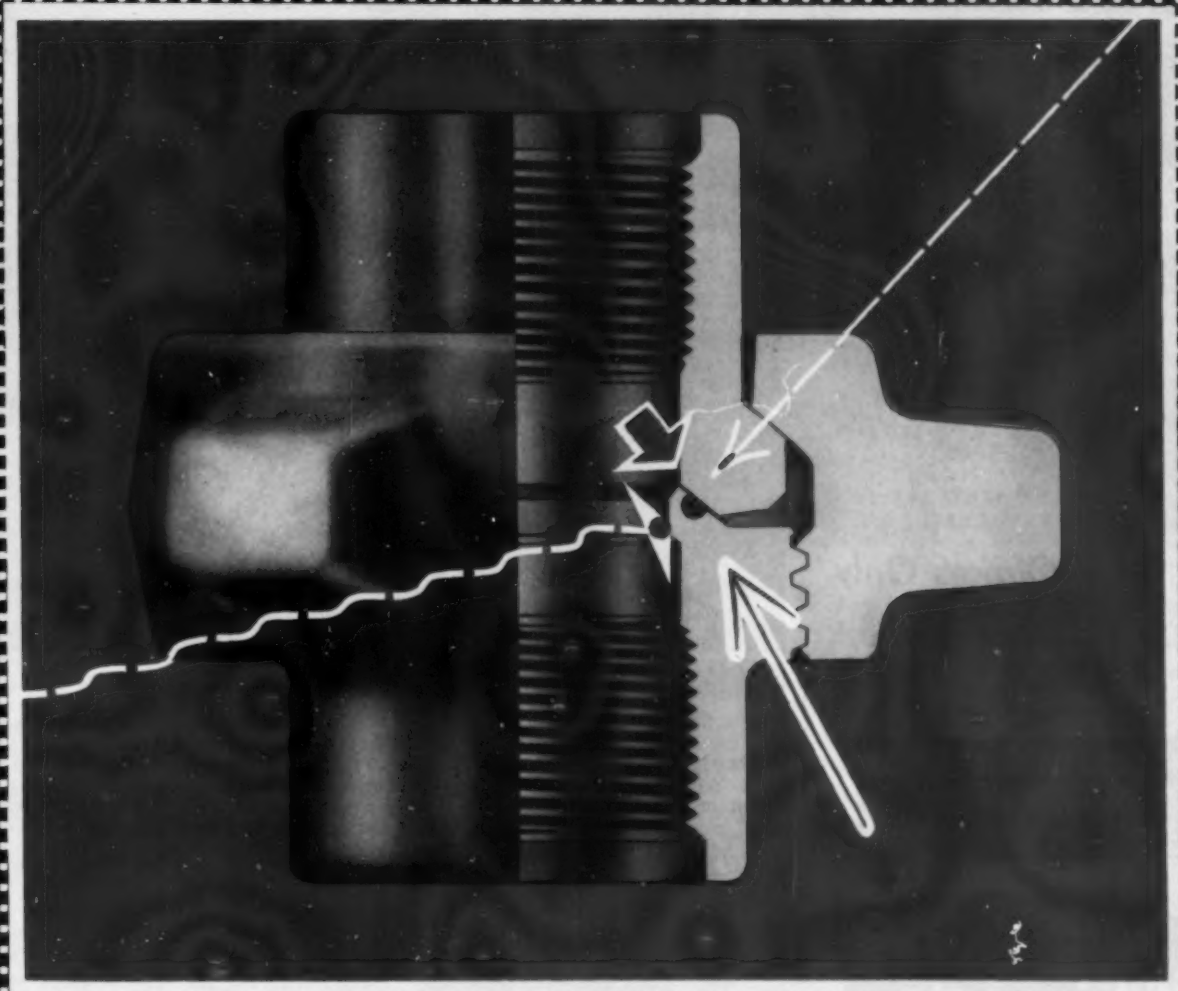
FLOMAX pumps are	*FLOMAX* pumps have
Self-Cleaning	Replaceable Wear Plate
Non-Clogging	Removable Inlet and Outlet Flanges
Quick Priming	Higher Capacities and Higher Heads

MP

Write for free folder!

MARINE PRODUCTS COMPANY

515 Lycaste Ave., Detroit 14, Michigan



did you know O-C-T makes the "O" ring union that may be used to full rated pressure with or without the "O" ring

Here is another reason why O-C-T Type CO unions are tops in performance on your steam and high pressure lines. Impartial tests have praved these unions to be equally efficient at holding high pressures either with or without the "O" ring.

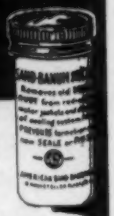
And it will hold high pressures with the nut only hand tight. Because of the ball seat feature, which provides for a misalignment of five degrees or one inch in one foot in any direction from center line, pipe need not be forced into perfect alignment in order to tighten the nut—as must be done with conventional wing unions.

Make sure of better connections on your lines. Ask your supply store about O-C-T Type CO Acme Ball Seat Misaligning Unions. Available through more than 700 supply store locations.

OIL CENTER TOOL COMPANY· HOUSTON, TEXAS

SAVE MONEY

SAND-BANUM SPECIAL



TABLETS REMOVE AND PREVENT RUST AND SCALE IN ALL RADIATOR COOLING SYSTEMS

More Power - Less Cost
Fewer Shut-Downs

SAND-BANUM

REMOVES AND PREVENTS BOILER SCALE AND CORROSION

Ounces Only Once a Week

Stocked By
Leading Supply Houses

AMERICAN SAND-BANUM CO.
Established 1926
9 Rockefeller Plaza
New York 20, N.Y.

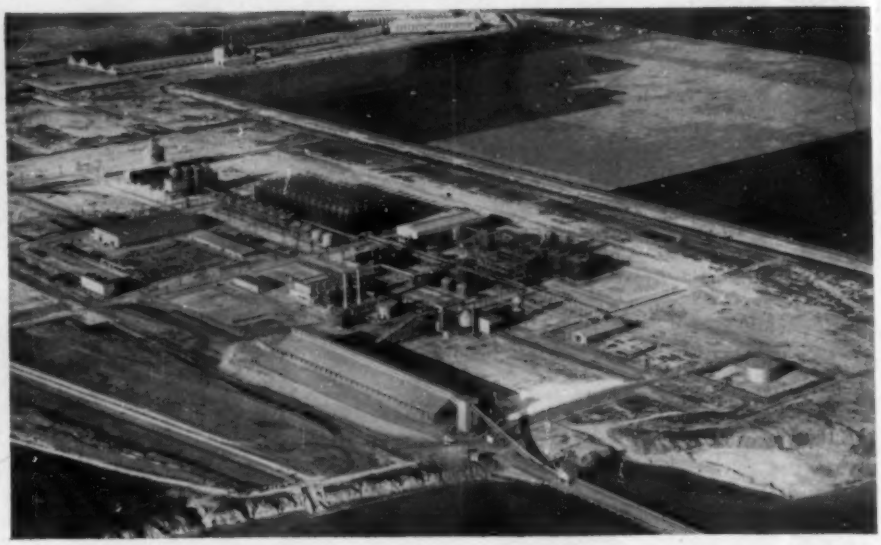
Keep Rights-of-Way Cleaned Up

You can maintain oil and gas line rights-of-way better, quicker and at less cost with a Caldwell S-2 Rotary Brush Cutter. The 57-inch Spring Steel Blade will cut brush up to two inches thick, and better, and will do it in a once-over, trouble-free operation. Timken Bearings, Blood Bros. Universal. Users include Tennessee Transmission, Transcontinental, Texas Illinois Transmission, others. We'll give you a demonstration. Write Dept. W.

E. L. CALDWELL & SONS
CORPUS CHRISTI, TEXAS

What's Happening

AMONG SERVICE AND SUPPLY MEN



Reynolds Metals Operates Two Industrial Plants

Across the bay from Corpus Christi, Texas, Reynolds Metals Company has built and put into operation two industrial plants for the production of aluminum. In the photograph are shown La Quinta alumina plant in the foreground and San Patricio reduction plant in the background. The La Quinta-San Patricio industrial complex is the only aluminum-processing center in the U. S. where bauxite-ore is delivered by ocean-going ships and then converted to pig-aluminum without overland shipment.

Le Roi Appoints J. E. Heuser To Vice Presidency of Sales

Le Roi Company has appointed Jack E. Heuser vice president of sales. Heuser will be responsible for the organization and management of a newly-created sales division to sell and service all Le Roi products.

J. E. Heuser

Heuser joined Le Roi in 1939. He became a member of the Ampco Metal sales organization in 1941 and served as manager of the Pittsburgh district and later the Los Angeles district. In 1946 Heuser rejoined Le Roi as assistant to the general sales manager and later became engine division sales manager.

Reilly Tar & Chemical Opens New Sales Office in Houston

Announcement has been made of the opening of a new Houston sales office of the Reilly Tar & Chemical Corporation. Located in the Green Building—Suite 11, 2009 Fannin Street—this office will be supervised by Donald Becker.

Centriline Corporation Names President and Vice President

William E. Borbonus has been elected president and Kenneth K. Kirwan vice president and chief engineer of Centriline Corporation, New York, wholly owned subsidiary of Raymond Concrete Pile Company, New York.

Borbonus was formerly president and chairman of the board of R-S Products Corporation of Philadelphia. He succeeds James P. Cummins who has been president of Centriline Corporation since January 1951. Cummins has been assigned to the Sales department of Raymond Concrete Pile Company with headquarters in New York, and will continue his official interest in Centriline Corporation as a vice president of that company.

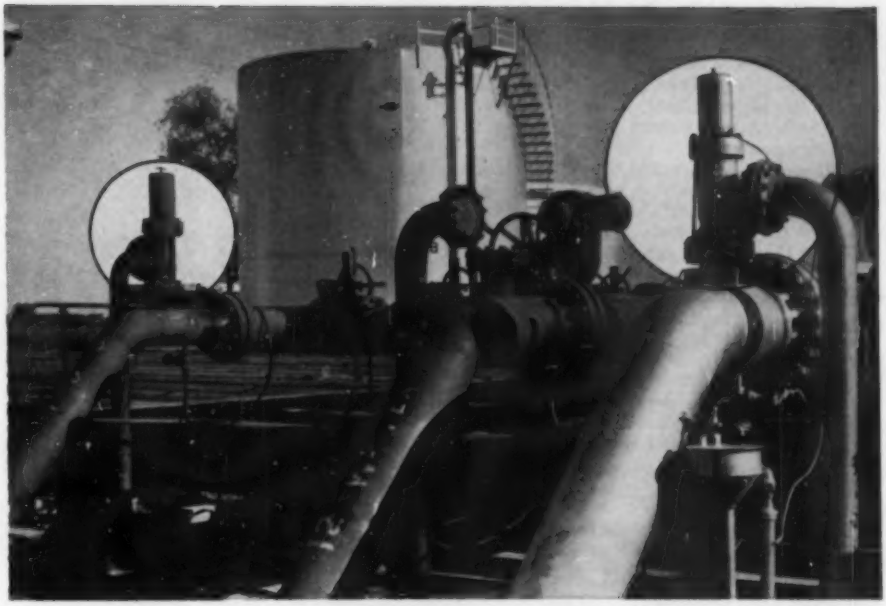
Kirwan has been with Centriline Corporation since March 1947.

Leschen Wire Rope Appoints Clarke General Sales Manager

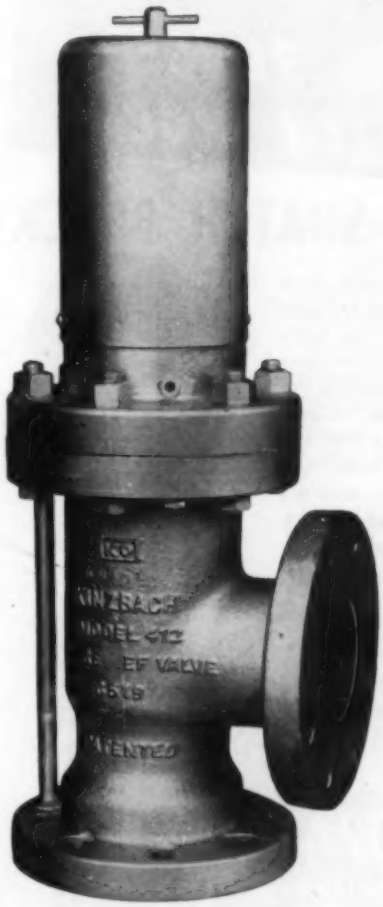
L. Jack Clarke has been named general sales manager, Leschen Wire Rope Division, H. K. Porter Company, Inc.

Clarke has served the Leschen organization as field representative in the New Orleans area and as manager of the New York sales district. He will make his headquarters at the division's main offices in St. Louis. Previously he was a heavy earth moving contractor.

L. Jack Clarke



Positive Protection Against Pressure Surges



KINZBACH
MODEL 412
RELIEF VALVE
for Pipelines and Refineries

When a pressure overload in the line is reached, the Kinzbach Model 412 Relief Valve opens instantly to full capacity. This valve provides automatic resetting at a pre-determined pressure drop, positive seating and facilities for functional testing.

The Model 412 uses line pressure for opening and closing. The opening pressure is preset by application of a dead weight load. Opening and closing action is positive and reliable. The pre-set pressure never changes.

Kinzbach Model 412 Relief Valves are available in 2", 3", 4", 6" and 8" sizes for working pressures up to 1000 p.s.i. Write for Bulletin RV412 for full technical data.

KINZBACH TOOL CO INC

KINZBACH TOOL COMPANY, INC.

P. O. Box 277 Houston, Texas

Export Office: 74 Trinity Place, New York, N. Y.

For more data on advertised products, use Readers' Service Cards, last page.

Comes Elected Vice President Of Farrel-Birmingham Company

Farrel-Birmingham Company, Inc., has announced the election of Donald A. Comes as vice president. He will also continue to hold his present position as general sales manager.

Comes has been connected with Farrel-Birmingham Company since 1922. He was a sales representative in the New Jersey territory for a number of years, with an office at Hackensack, and was particularly active in developing the use of Banbury mixers in the rubber, plastics, linoleum, paint and other industries.

Comes was transferred to the Farrel-Birmingham main office at Ansonia, as manager of the Banbury Mixer department. Later he was promoted to assistant general sales manager and in 1953 was named general sales manager.

C. Weston Goode

H. J. Smith

Goode and Smith Appointed To Gustin-Bacon Posts

Gustin-Bacon Manufacturing Company announces the appointment of two new district managers: C. Weston Goode, southeastern United States; and H. J. Smith, Kansas City sales division.

Goode, Atlanta sales representative for Gustin-Bacon since 1944, is in charge of the newly opened district office at 2025 Peachtree Road, N. E. Atlanta. Smith has been with the company since 1949 as representative in Louisville and St. Louis. He will direct sales in Colorado, Wyoming, Nebraska, Kansas, Oklahoma, Arkansas, Texas Panhandle, southern Illinois, western Tennessee and northern Mississippi.

Depew Appointed Claims Manager For Kaiser Steel Corporation

William A. Depew has been appointed claims manager for Kaiser Steel Corporation. Depew was formerly superintendent of the Metallurgical Engineering department at the company's steel plant in Fontana and was previously head of the plant's Metallurgical and Quality Control Departments. In his new post, Depew will have offices in Los Angeles.

William A. Depew

Born in Oelwein, Iowa, he received his education in Canada and was employed in various steel and foundry companies there in inspection departments. He came to Kaiser Steel at the start of plant operations in 1943 from the Steel Company of Canada, Hamilton, Ontario, where he had been chief inspector for three years.

Gaso Pump & Burner Names Pacific Coast Distributor

Gaso Pump & Burner Manufacturing Company, Tulsa, announces the appointment of Power Pumps, Inc., as Pacific Coast distributor for Gaso pumps. Headquarters of Power Pumps, Inc., are at 3273 Cherry Avenue, Long Beach, where complete stocks of Gaso pumps and parts will be maintained.

The new distributing company is headed by Ralph Abbott and associates. Abbott has had 15 years' experience in the oil fields of California, 13 of them as branch and area manager for Republic Supply Company. For the past two years he has been special manufacturers' representative specializing in products used in the oil and pipe line industries.

Bonney Forge & Tool Works Names Bader Sales Engineer

Robert Bader has been appointed sales engineer at Houston, for the Welding Fittings division of the Bonney Forge & Tool Works, Allentown, Penn.

Robert Bader

Bader is a native of Bethlehem, Penn. He served in the United States Merchant Marine and is a graduate of Blair Academy, the United States Merchant Marine Academy and Princeton University.

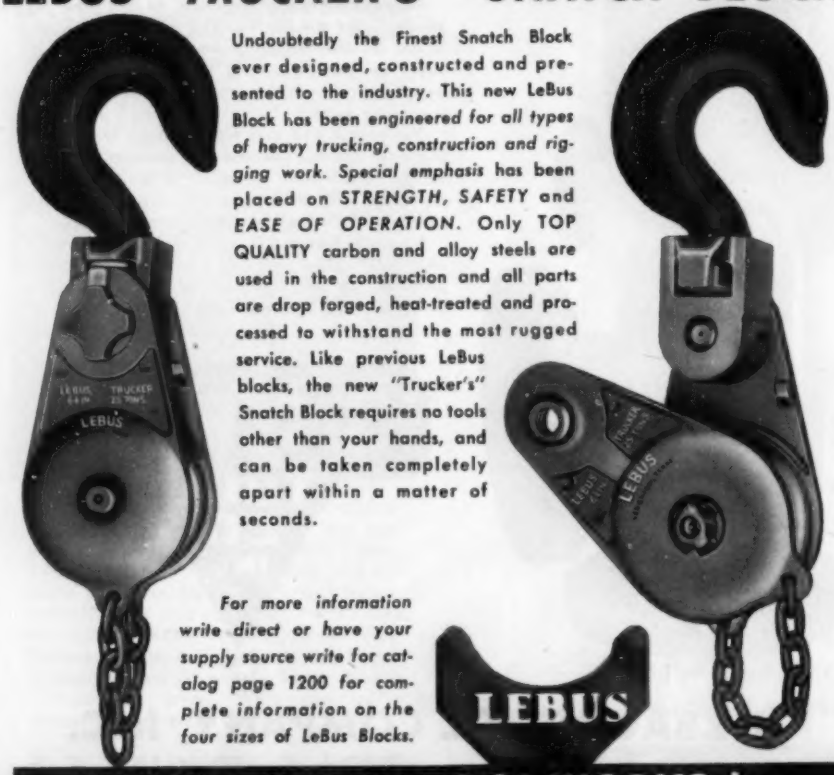
Prior to his assignment to Houston, Bader served with Bonney's eastern sales division.

NOW

A SAFER FASTER MORE RUGGED SNATCH BLOCK

the NEW

LEBUS "TRUCKER'S" SNATCH BLOCK



Undoubtedly the Finest Snatch Block ever designed, constructed and presented to the industry. This new LeBus Block has been *engineered for all types of heavy trucking, construction and rigging work. Special emphasis* has been placed on *STRENGTH, SAFETY* and *EASE OF OPERATION*. Only TOP QUALITY carbon and alloy steels are used in the construction and all parts are drop forged, heat-treated and processed to withstand the most rugged service. Like previous LeBus blocks, the new "Trucker's" Snatch Block requires no tools other than your hands, and can be taken completely apart within a matter of seconds.

For more information write direct or have your supply source write for catalog page 1200 for complete information on the four sizes of LeBus Blocks.

LEBUS ROTARY TOOL WORKS, inc.

P. O. BOX 2352 • LONGVIEW, TEXAS Phone Plaza 9-2771

Ray H. Rodolf

Herschel V. Hiatt

Rodolf and Hiatt Receive Appointments in Le Roi Company

Le Roi Company has announced the appointment of Ray H. Rodolf as general manager, Compressor division, and Herschel V. Hiatt general manager, Engine division.

Rodolf moves up from sales manager, Construction and Mining division. Hiatt joined Le Roi about a year ago as director of engineering. Formerly Hiatt was with Allison division of General Motors and with Warner Corporation. Before joining Le Roi in 1950, Rodolf was with the Gardner-Denver Company as sales manager of the Pump, Compressor and Oil Field division.

Zvone Appointed Vice President Of U. S. Steel Corporation

Joseph W. Zvone has been appointed vice president—engineering and operations—of United States Steel Supply Division of U. S. Steel Corporation.

Zvone succeeds William L. Davis, who is retiring after 48 years of service. Davis joined U. S. Steel in 1905 as a shipping clerk in Donora, Penn.

STATEMENT REQUIRED BY THE ACT OF AUGUST 24, 1912, AS AMENDED BY THE ACTS OF MARCH 3, 1933, AND JULY 2, 1946 (Title 39, United States Code, Section 233) SHOWING THE OWNERSHIP, MANAGEMENT, AND CIRCULATION OF PIPE LINE INDUSTRY, published monthly at Houston, Texas, for October, 1954.

1. The names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Ray L. Dudley, 3371 Chevy Chase, Houston, Texas; Editorial Director, Warren L. Baker, 5324 Cherokee, Houston, Texas; Editor, Donald M. Taylor, 1345 Chamboard Lane, Houston, Texas; Managing Editor, Al Reese, 9112 Westview, Houston, Texas; Business Manager, A. L. Burns, 7 Chelsea Place, Houston, Texas.

2. The owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding 1 percent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a partnership or other unincorporated firm, its name and address, as well as that of each individual member, must be given.) The Gulf Publishing Company, Houston, Texas; James Anderson, Houston, Texas; June Wooden Bliss, Houston, Texas; June Wooden Dudley Bliss—Trustee, Houston, Texas; A. L. Burns, Houston, Texas; Mrs. Grace C. Carter, Tulsa, Oklahoma; Mrs. Margaret D. Cashman, Houston, Texas; P. Stinson Dudley, Gainesville, Texas; Ray L. Dudley, Houston, Texas; Wm. G. Dudley, Houston, Texas; Wm. V. Gross, Fort Stockton, Texas; Carolyn Dodson Keeble, Pecos, Texas; Mrs. Anita S. Lane, Houston, Texas; Charles H. Lane, Houston, Texas; James William Nelson, Baytown, Texas; Tom W. Nelson, Houston, Texas; J. Kent Ridley (Deceased), Houston, Texas; Walter Gage Sterling—Trustee, Houston, Texas; O. R. Waller, Chicago, Illinois; Mrs. Patricia McFarland Windham, Austin, Texas.

3. The known bondholders, mortgagees, and other security holders owning or holding 1 percent or more of total amount of bonds, mortgages or other securities are: (If there are none, so state.) M. D. Anderson Foundation, Houston, Texas.

4. Paragraphs 2 and 3 include, in cases where the stockholder of security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting; also the statements in the two paragraphs show the affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner.

5. The average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the 12 months preceding the date shown above was: (This information is required from daily, weekly, semiweekly, and triweekly newspapers only.)

WARREN L. BAKER, Editorial Director.

Sworn to and subscribed before me this 16th day of September, 1954.

P. J. AUCOIN,
(Seal) Notary Public in and for Harris County, Texas.
(My commission expires June 1, 1955.)

eliminate compression pulse-beat or pressure surges

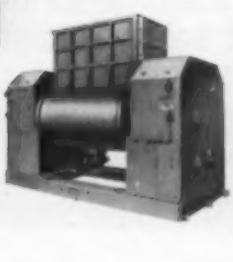
Pulse-beats indicate a healthy heart, but in the refining industry, pulse-beats or pressure surges indicate an inefficient compressor. The *Standardaire Blower* assures refinery users a blower completely free of compression shocks and fluctuating pressures. The *Standardaire* achieves this important feature by its cycloidal form, screw type rotors which draw the air or gas in and discharge it smoothly from the pockets which form between the rotors.

To move more gas or air with less wear, and lower maintenance and power costs, specify the *Standardaire Blower*. Write today for Bulletin B-154.

READ STANDARD
CORPORATION

BLOWER-STOKER DIVISION
370 Lexington Avenue
New York 17, New York

Read Standard also manufactures a complete line of chemical mixers for laboratory and industrial use. For information write, Read Standard Corp., York, Pa.



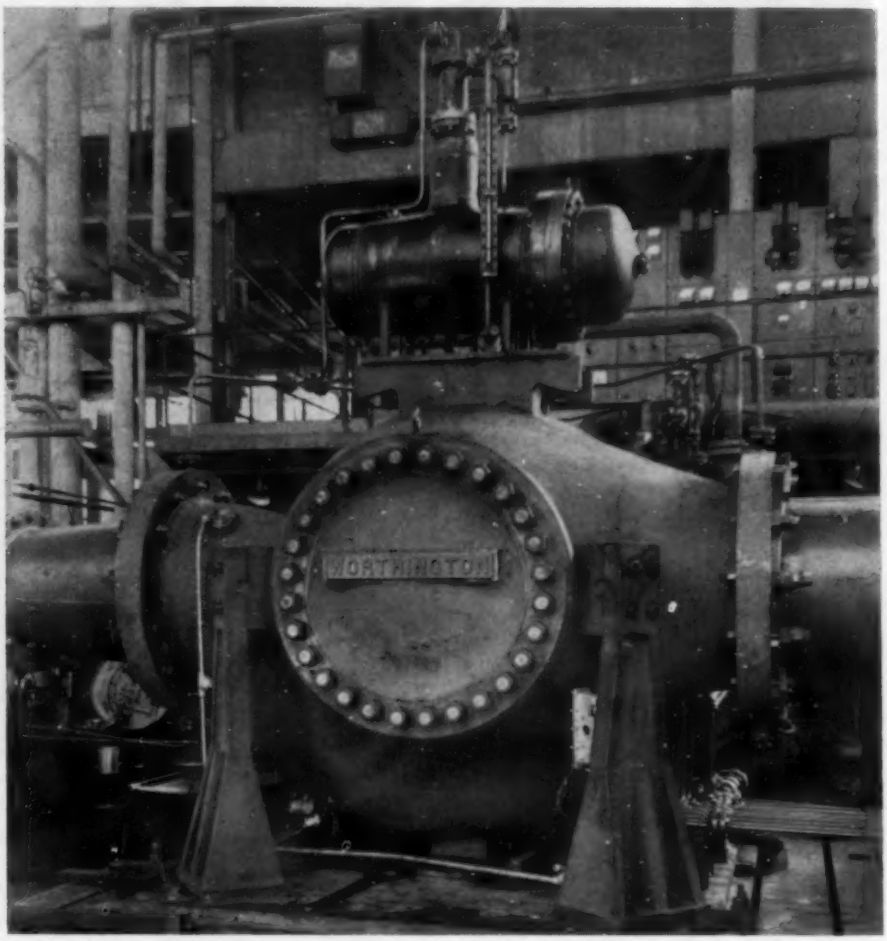
What's New in Equipment

for the Pipe Line Industry

Novel design

featured in this

New Centrifugal Compressor



Worthington Corporation type GUP single stage Centrifugal Compressor built for the Northern Natural Gas Company of Omaha, Nebraska, will be in operation at their Macksville, Kansas booster station. The station is on the main transmission line of Northern Natural Gas which runs from North Texas to the Minneapolis-St. Paul area. Designed for gas transmission pipeline service, machines of this type are available in several sizes having either 20, 24, or 30-inch inlet and discharge flanges. They can be driven by gas engine with speed increasing gears, electric motor, steam or gas turbines.

The first-stage unit in a four-unit station, the Northern Natural Gas machine will be driven by a 5700 horsepower two-shaft General Electric Gas Turbine. It is designed for a rated flow of 748 million cubic feet per day with a suction pressure of 434 pounds per square in. Its discharge pressure is about 500 psi and its nominal operating speed of 4750 revolutions per minutes requires 5200 horsepower.

In the engineering of this machine, Worthington has introduced novel design features to provide a maximum of reliability and versatility. Main casing and support design have been conceived to minimize shaft center-line distortions arising from the high pressure in the casing. Allowing for a maximum working pressure of 1000 psi, the casing is designed so that various impellers may be used as the flow conditions of the pipeline may require on future expansions. The shaft barrel supporting the rotor is carried on the casing cover and is easily removable through the front of the machine with assembly tools provided by Worthington.

Spherical shape of casing provides a cavity behind the impeller which is an additional safeguard against accidental seal oil leakage into the gas stream. The impeller is a high strength aluminum alloy precision casting or forging providing a light rotor of superior strength. The high pressure shaft seal is a design that has had extensive service on centrifugal compressors of this type. An integral lubrication and seal oil system is provided which is independent of the driver-lubrication system.

A single pump used on the Worthington compressor for both seal oil and bearing lubrication, is mechanically driven from the compressor shaft and supplies seal oil at a pressure somewhat in excess of the gas pressure at the seal. An elevated tank stores an emergency supply of oil at sufficient pressure to supply the seal and lubricate the bearings during a pump failure.

The oil supply from the pump is divided by a control valve which is operated by a level signal from the elevated tank. The stream running through the control valve enters the barrel at an intermediate pressure and the full pump delivery passes through the thrust bearing and the inboard journal bearing. No internal bearing mishap can result in starving another bearing. Miscellaneous level and temperature alarm devices are provided and most of the lube system equipment is housed in a separate console.

(This item supplements Worthington Corporation data on pages 5221-5240 of The Composite Catalog, 20th Edition.)

For more data, circle **No. E1** on Readers' Service Card, last page this issue.

Electronic Computer

The pipe line industry got its first glimpse of National Cash Register's new electronic computer at a special demonstration showing at Houston. Called the

Save time! Keep informed! Circle numbers on Readers' Service Cards, last page this issue.

1. Works Harder . . .

Bucyrus-Erie's Individual Design throughout means that every part of the 22-B is designed to work at peak efficiency, that power is right for the load, and that all parts are fully coordinated for faster, smoother digging cycles. Lost time and waste motion are eliminated. The machine *works harder,* day after day.

2. Lasts Longer . . .

Individual Design means not only fewer wearing parts, but less wear and tear on all parts, thus less maintenance and longer life. Liberal use of anti-friction bearings rides power to point of application with a minimum of wear. Bucyrus-Erie machines have earned a reputation for staying on the job, wherever they work.

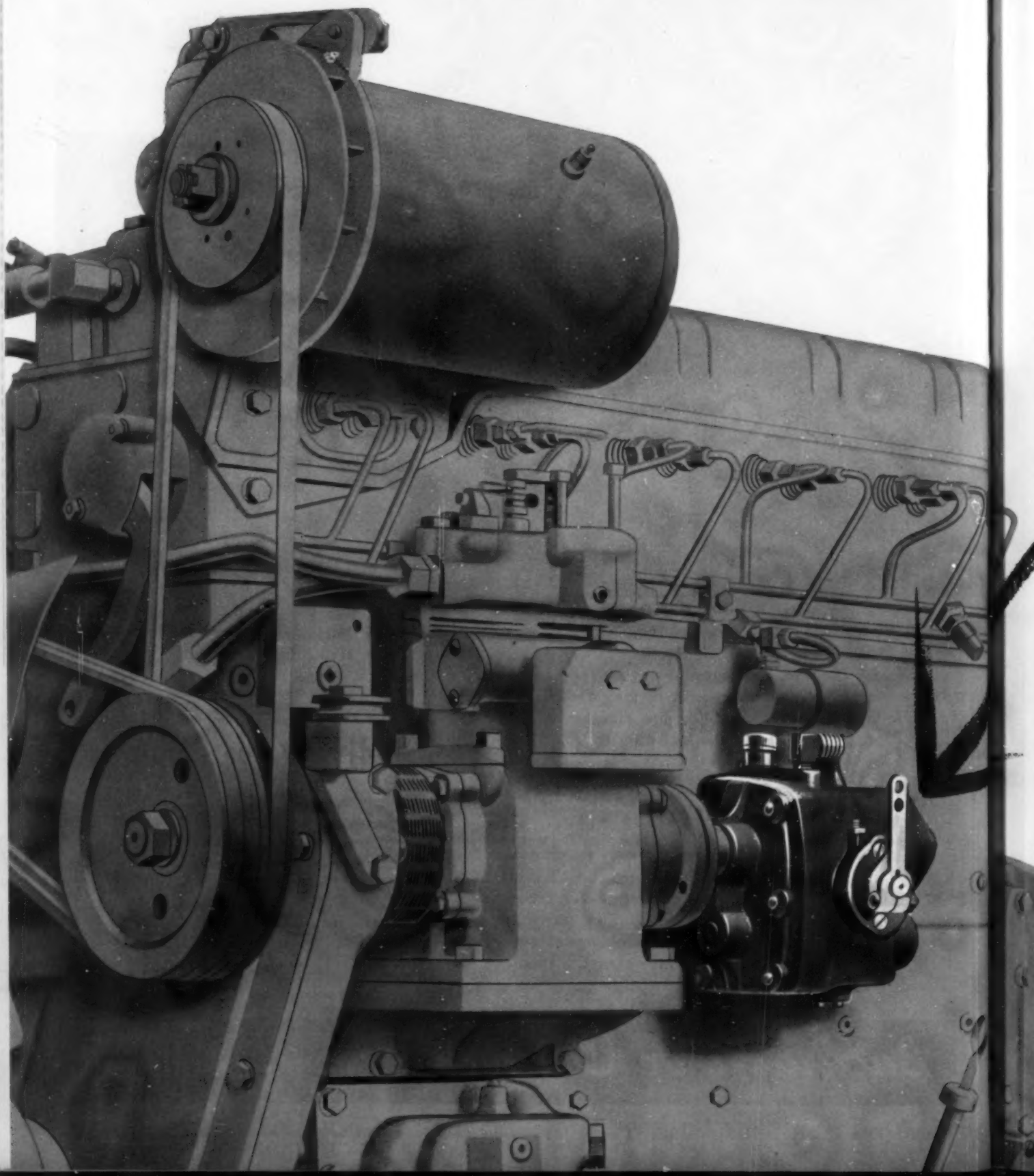
See your Bucyrus-Erie Distributor for the full story of Individual Design on the 22-B dragshovel . . . the really dependable trenching machine for pipeline work. 19E54

*** Individual Design**

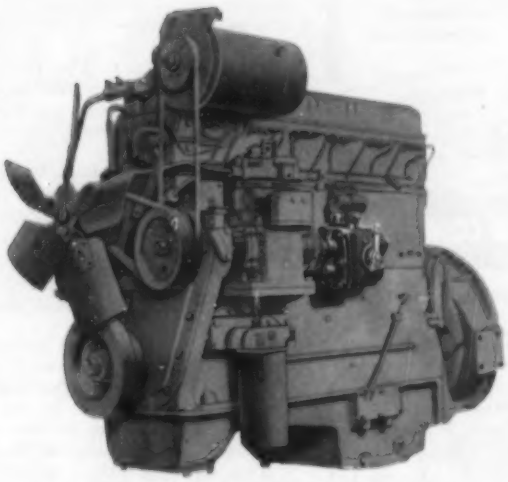
. . . means that each model in the Bucyrus-Erie excavator line is designed from the ground up to handle its rated load. There is no over-powering or over-dippering to create "new" models. Proper proportioning of all parts means that none are too large or too small, too heavy or too light for the stresses they must carry.

Bucyrus-Erie Company South Milwaukee, Wisconsin

Cummins new, exclusive diesel f



fuel system needs no specialists!



PT Fuel System standard on all models...simpler to work with than gasoline carburetion and ignition

- Fuel system servicing costs become negligible.
- Compact pump weighs only 13 pounds—system has no fuel racks to adjust . . . no check valves, metering plungers,discs, or floats—pump not timed to engine.
- Fewer parts than any fuel system on any heavy-duty engine.
- Adaptable to all Cummins Diesels built since 1932.

Write for your copy of descriptive folder "Cummins PT Fuel System."

CUMMINS **Cummins**

Engine Company Inc., Columbus, Indiana

Leader in rugged, lightweight, high-speed diesels (60-600 h.p.)

HIGH
Efficiency
with
FRANCE

You engineers know that a bakelite material, that can remain unchanged for *15 hours, under critical operating conditions, while competitive products under similar test conditions were destroyed, is a proved: highly effective material.

FRANCE CARBON-BAKELITE PISTON RINGS for your gas compressors will outlast any comparable material—no deterioration with age or use; not affected by wet or sour gases.

*Data on complete test available on request.

CARBON
BAKELITE
PISTON
RINGS

Write for Complete Information

MAXIMUM SERVICE for you in our NEW PLANT

FRANCE PACKING COMPANY

9925 Bustleton Ave., Philadelphia 15, Pa.

Note on Automatic Shut-off Valves

★ POSITIVE ACTION
★ ACCURATE TIMING
★ HEAVY DUTY CASE
★ SIMPLE OPERATION
★ FULLY AUTOMATIC

For complete information, send for our new bulletin #101.

ROACH
EQUIPMENT CO.
801 W. 23 ST. . . . TULSA, OKLA.
P. O. BOX 1067 . . . DIAL 5-1259

Model CRC 102-A electronic Computer with auxiliary Magnetic Tape Unit Model CRC 126, this electronic brain is designed to (1) process all types of data, (2) solve endless engineering and accounting problems, and (3) keep records for scientific, engineering and business operations. This new system consists of three major units: (1) the Computer, a Magnetic Tape Unit and a control console. In addition, auxiliary equipment includes a Flexowriter with attached paper tape reader and paper tape perforator, an IBM Type 523 Summary Punch used for reading cards, an IBM Type 523 Summary Punch used for punching cards, and as many as eight CRC 126 Magnetic Tape-Handling units.

The Computer is designed to accept properly organized numerical information as it is typed on the Flexowriter keyboard, which may be operated manually or by means of the attached paper tape reader. Tapes may be prepared in advance or when the information is entered manually. Paper tapes provide a useful storage medium for standard lists of instructions which are used as subsections of more complicated routines or for the processing of day-to-day business. The Flexowriter is also used as an output printer for the computer. Results may be typed on cards, pages, prepared forms, or masters for the duplicating processes.

The Magnetic Tape-Handling Unit records information and has a capacity equal to that of 64 magnetic drums. Information so stored can be relocated when needed. To operate parallel electronic and punched-card systems, the CRC Model 102-A Computer is fitted to read and punch IBM cards.

Thirty six or fewer columns of data or four complete instructions may be read into the computer from each card. A magnetic storage drum in the Computer is capable of retaining at one time the information read from 256 such cards.

The demonstration included the solution of several business and engineering problems. Pipe line guests were particularly interested in the solution of problems arising in the operations of a natural gas pipe line.

Available on a lease-purchase plan or outright purchase, this new computing system offers a wide variety of applications in the pipe line industry. Accounting problems, business analysis, marketing problems, solution to complicated engineering and design problems are but a few of the possibilities of this machine.

For more data, circle **No. E2** on Readers' Service Card, last page this issue.

Magnetic Inspection Kit

An entirely different magnetic particle inspection kit is being announced by Magnaflux Corporation. Called Y-5 yoke kit, it is designed especially for preventive maintenance inspection, for weld inspection, and for limited volume inspection of any magnetic part wherever surface cracks are suspected.

The Y-5 yoke kit comes in a metal carrying case and weighs less than 30 pounds complete. The yoke itself is the magnetizing and testing instrument and weighs only seven pounds. It draws six amps from any 110 volt AC line. Industry will find this new development particularly useful for checking pump parts, valve bodies, welds, collars, etc.

The inspection operation by use of this new development requires only one man. He handles the yoke with one hand, controlling both power and position, and with the other he dusts on the Magnaflux powder. The area covered by each application of the yoke varies up to approximately 24 square inches.

The lightweight and compact features of this new development make it a natural for field use.

(This item supplements Magnaflux Corporation data on page 2996 of the Composite Catalog, 20th Edition.)

For more data, circle **No. E3** on Readers' Service Card, last page this issue.

Utility Compressor

Due to increased demand, Le Roi Company has put the 105 cfm utility compressor back into the Airmaster line.

The new utility has several improved features including better air cleaning and cooling through the use of oil bath air cleaners and a pressurized cooling system. The 105 cfm utility compressor uses the same engine as is used in the Le Roi 105 portable; however, it is built up under one housing including an upright air receiver. This space-conserving feature makes the utility ideal for mounting crosswise between a truck cab and allows plenty of extra room for other equipment and materials. Overall width of the unit is only 25 inches and the over-all length is 82 inches.

All controls and instruments are conveniently located. Water, gasoline, and oil filler necks all protrude from the top hood for easy filling without removing the lightweight grill-type hood sides.

For more data, circle **No. E4** on Readers' Service Card, last page this issue.

Fuel Generator

A unique fuel generator which converts a fraction of the crude oil from a well or pipe line into fuel for internal combustion engines has been developed and is being manufactured by Carbro, Inc.

The Carbro generator draws a small amount of crude from the gun barrel on a pumping well or from the pipe line. The exhaust gas from the internal combustion engine heats the Carbro fuel generator which separates a small amount of volatile gases from the crude. This gas is stored in a volume tank which is connected to the carburetor of the engine, or in the same place that costly butane or natural gas is connected. The generator operates at a pressure at or slightly below atmospheric and at a temperature never above 160° F.

Carbro fuel generators are available in two models. Model 20 for use on engines up to 40 horsepower, and Model 100, for use on engines from 40 to 100 horsepower. The average installation time for the Model 20 is about two men for one-half day and for the Model 100—two men for about two days.

For more data, circle **No. E5** on Readers' Service Card, last page this issue.

Save time! Keep informed! Circle numbers on Readers' Service Cards, last page this issue.

New Catalogs and Equipment Literature

Power Products Catalog

The complete line of International Industrial Power products, 73 in all is described in a new 48-page catalog just published by the International Harvester Company.

Technical data has been streamlined, yet provides abundant descriptive material on each piece of equipment in the entire line.

First of the eight sections in the catalog describes the seven International crawler tractors. This is followed by descriptive information on the International 2T-75 and 2T-55 rubber-tired tractors with scrapers and the 2S-75 bottom dump wagon.

Two push-loaded and two self-loaded four-wheeled scrapers are pictured and described in the third section of the catalog while the fourth section is devoted to 22 hydraulic and cable-controlled bulldozers, bullgraders and angle bulldozers in the new International line.

Allied equipment or attachments to International crawler tractors, such as Drott skid-shovels and Superior sidebooms are featured in the fifth section and cable control units and International wheel tractors for industrial use are presented on the pages forming the next two sections of the catalog.

Final portion covers the 18 models of International diesel, gasoline and gas power units.

To get a copy, circle **No. E6** on Readers' Service Card, last page this issue.

Packing Brochure

A completely new folder describing Garlock's patented lattice braid rod and shaft packings is available from the company. The folder points out the construction features of lattice braid and describes available materials, sizes, and forms. It also contains illustrative service reports from users in various industries.

To get a copy, circle **No. E7** on Readers' Service Card, last page this issue.

Alloy Bulletin

A new 48-page bulletin for users and potential users of stainless and heat resistant alloys in cast form has just been released by International Nickel Company.

Typical compositions of regularly produced alloys, with their applications, limitations and the types of service for which they are suitable, are discussed. Over 175 photographs illustrate applications of typical alloys by industry. Charts compare creep strength of various alloys, resistance to corrosion in certain media, and oxidation at elevated temperatures. Tables of composition list principal Alloy Casting Institute designations, as well as certain proprietary alloys.

To get a copy, circle **No. E8** on Readers' Service Card, last page this issue.

Motor Pump Booklet

A very interesting and informative booklet, dealing with the selection of the proper motor pump for any specific job, has just been published by Ingersoll-Rand Company. Actually, this booklet is a slide film presentation in printed form.

The booklet gives a brief description of what a centrifugal pump is, and how it works. Then it points out the various factors, such as the quantity, pressure, friction losses and head that must be considered in selecting a pump to meet a specific installation. It also gives a typical problem and its solution by means of material shown on previous pages such as charts and curves of various forms.

To receive your copy of this informative bulletin, simply . . .

To get a copy, circle **No. E9** on Readers' Service Card, last page this issue.

Flow Meters

The Industrial Division of Minneapolis-Honeywell Regulator Company has just released a new catalog which describes all of its types of flow meters. The catalog includes indicating, recording, integrating and controlling instruments of both evenly graduated and square root types, as well as area meters and differential converters. Also included is a section on flow approximations and installation information.

To get a copy, circle **No. E10** on Readers' Service Card, last page this issue.

In this business— as in every industry— leadership depends on quality of product.

The importance of plastic linings to prevent pipe corrosion, resist paraffin deposition, and provide more flow with less friction is recognized throughout the oil industry.

But all plastics are not alike. When the useful life of equipment costing thousands depends on the plastic lining used, it is sound business judgment to demand the best.

That is why Tube-Kote has been able to retain their leadership in this industry for more than fourteen years—because they provide the finest plastic linings obtainable. The manufacture of non-corrosive plastic linings and plastic pipe is their only business. They have pioneered in plastics since 1939—put all their energy, experience, research, equipment and oil field experience in this one business. This important factor of specialization is your assurance of the finest product obtainable.

Plastic lining at Tube-Kote's Houston plant is a thorough, assembly-line process . . . from the initial pipe cleansing baths . . . multiple neutralizing rinses . . . scale-removing pickling baths . . . continual inspection throughout the process . . . to the automatic, uniform coating with Tube-Kote's exclusive, specially formulated plastic coatings which are thermo-baked to the metal surface.

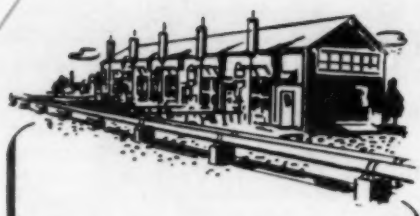
Tube-Kote gives you the extra quality of product that makes this company the leader in the industry.

Specifications and data about Tube-Kote plastic linings and plastic pipe available on request—write for it.

TUBE-KOTE T.M. REG

TUBE-KOTE, INC.
2520 Holmes Road • P. O. Box 20037
Houston 25, Texas

For more data on advertised products, use Readers' Service Cards, last page.



proficiency . .

• in construction is the product of skill, knowledge, and the experience of men dedicated to their work.

STATION CONSTRUCTION CO.

General Contractors

J. B. Latham, President.

2518 DREXEL DR., HOUSTON, TEXAS

CRUDE OIL • OIL PRODUCTS
GAS AND WATER PUMP STATIONS
TANK FARM SYSTEMS • TERMINALS

The First Completely

SAFETY-ENGINEERED PIPE LINE SLING

GREENHEAD SLINGS have approximately 100,000 lbs. more strength than ordinary slings. GREENHEAD SLINGS give you lower cost, greater durability, lighter to handle, easily operated by one man.

- 10 ply belting covers ropes on pull-out side
- No stretch to tear pipe wrapping
- Cable Protector saves wire ropes
- Tough, cast, bearing-plates
- 4-9/16" wire ropes in basket hitch, 222,400 lbs. ultimate strength
- Completely eliminates the old ball and pins

Write us about your special sling requirements

GREENHEAD SLING AND SUPPLY COMPANY

3912 Leeland Houston, Texas

Advertisers' Index

• Dot preceding name of advertiser indicates that detailed data on products and services of the firm will be found in current 20th (1953-54) edition of The Composite Catalog of Oil Field and Pipe Line Equipment.

A

Aero Service Corp. 83
Aerofin Corp. 110c
• The Aerotec Corp. 75
• Allis-Chalmers Mfg. Co. 21
Alston Manufacturing Co. 82a
American Bosch Division
American Bosch Arma Corp. 123
American Meter Co. 84
• American Sand-Banum Co. 110a
American Telephone & Telegraph Co. 34

B

Bakelite Co. 27
The J. B. Beaird Co. 35
• Bethlehem Steel Co. 85
• Bethlehem Supply Co. 89
• Black, Sivalls & Bryson, Inc. 13
• Bucyrus-Erie Co. 115

C

E. L. Caldwell & Sons 110b
• Catawissa Valve & Fittings Co. 100
Caterpillar Tractor Co. 57
• Clark Bros. Co. 64-65
• The Colorado Fuel & Iron Corp. 31
The Continental Supply Co. 14-15
• Fred E. Cooper, Inc. 20
• Crane Co. 16
• Cummins Engine Co. 116-117

D

Dowell Incorporated 11
• Dresser Operations, Inc. 64-65

F

• Fairbanks, Morse & Co. 9
Fleet-Line Co. 108b
• Flexitallic Gasket Co. 10
• The Fluor Corp. 2
France Packing Co. 118a
• Frontier Industries, Inc. 90

G

• The Garlock Packing Co. 91
• Gaso Pump & Burner Mfg. Co. 124
• H. P. Gott Manufacturing Co. 107a
Greenhead Sling & Supply Co. 120b
• Grove Valve & Regulator Co. 28
Gulf Oil Corp. 36
• Gulf Publishing Co. 94b
Gunite Concrete & Const. Co. 106c

H

Harley Sales Co. 106
Houston Contracting Co. 96

J

• Jet-Lube, Inc. 104

K

Kaiser Steel Corp. 32
• Kinzbach Tool Co. 111

L

• LeBus Rotary Tool Works, Inc. 112
• Leschen Wire Rope Division
H. K. Porter Co. 79
• Lowell Wrench Co. 107b
• Lufkin Foundry & Machine Co. 29

M

Macwhyte Co. 19
• Manzel Division
Frontier Industries, Inc. 90
• Marine Products Co. 106d
Mayes-Bros. Inc. 94a
Merritt Products Co. 93

N

The National Bank of Commerce 12
• National Tank Co. 22
Newport Steel Corp. 37
• W. C. Norris, Manufacturer, Inc. 33

O

• Oil Center Tool Co. 109
• Oil Well Supply Division
United States Steel Corp. 5
• Otis Pressure Control, Inc. 7

P

Pacific Coast Borax Co. 101
• Pelican Supply Co. 120c
• H. K. Porter Co. 79

R

Read Standard Corp. 113
• Republic Steel Corp. 86-87
The Ridge Tool Co. 105
Roach Equipment Co. 118b

S

Second National Bank of Houston 18
Shand & Jurs Co. 6
• A. O. Smith Corp. 97
Southern Engine & Pump Co. 82b
• Southern Mill & Manufacturing Co. 92
Standard Oil Co. of California 24
Station Construction Co. 120a
• Steel Forgings, Inc. 108a
• Stewart & Stevenson Services, Inc. 68-69

T

Texas Employers Insurance Assoc. 30
• Thornhill-Craver Co. 17
Tracerlab Inc. 78
• Tretolite Co. 23
• Tube-Kote, Inc. 119

U

Union Carbide and Carbon Corp. 27
• Union Wire Rope Corp. 8
United States Steel Corp. 5

W

• W-K-M Manufacturing Co. 81
Walworth Co. 76
• Waukesha Motor Co. 26
Waukesha Sales & Service, Inc. 25
• Wickwire Spencer Steel Division
The Colorado Fuel & Iron Corp. 31
• Worthington Corp. 102-103

Y

The Youngstown Sheet & Tube Co. 99

NOTICE: Specify **PELCO** Welding Saddles

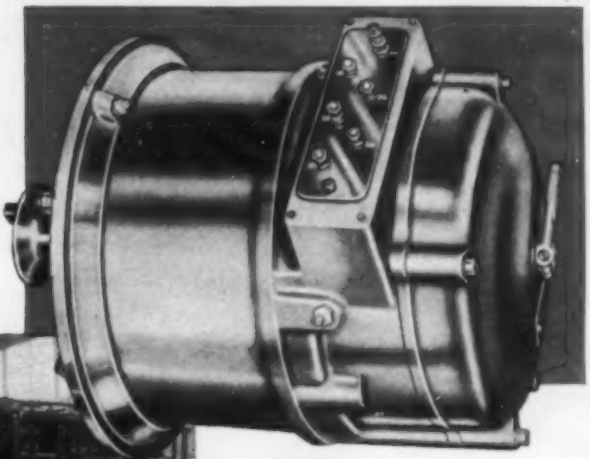
No change except the corporate name. We still have the same ownership, same management, same address, same telephone, and use the same 45 years of experience to render the same service under the same trade name—"PELCO."

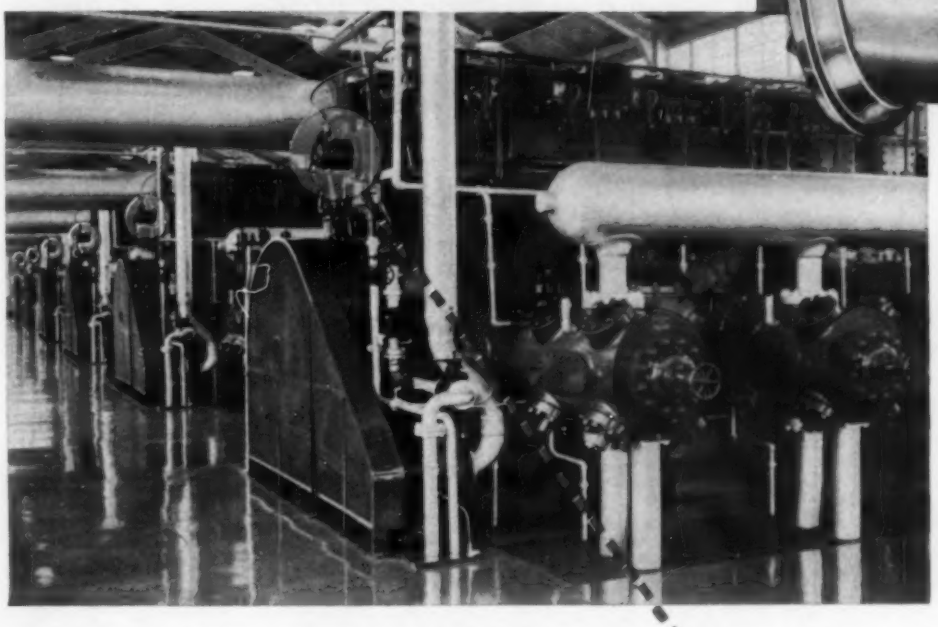
PELICAN SUPPLY CO. INC.

P. O. Drawer 1108 Shreveport (84), La.

SEE YOUR NEAREST SUPPLY HOUSE

SPECIFY THE AMERICAN BOSCH PULSE GENERATOR SYSTEM





FOR TROUBLE-FREE IGNITION ON YOUR CONTINUOUS SERVICE GAS ENGINES!

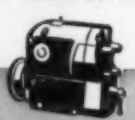
The first American Bosch Pulse Generator installation at the Michigan-Wisconsin Pipe Line Co. plant, New Windsor, Ill., ran constantly for 23 trouble-free months before removal for inspection. Subsequently, 18 engines in the Michigan-Wisconsin plants were equipped with the Pulse Generator System.

Here is the ultramodern Ignition System that is now saving time, trouble and money for many Oil Industry gas engine users. The new American Bosch MGC Pulse Generator System cuts maintenance costs and downtime caused by ignition troubles, provides constant, trouble-free operation over long periods—as shown in the case of the Michigan-Wisconsin Pipe Line Company engines pictured above.

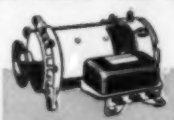
This new Ignition System generates precisely timed, low-voltage, high-current pulses. Passed through the primary winding of oil filled transformers at each cylinder, these pulses generate high voltage in the secondary winding, more than enough to provide reliable ignition for very high compression gas engines (from the current 250-400 psi to all presently contemplated engines of far greater compression pressures). Ignition cables carry only low tension current—no corona loss, no danger of fire or explosion. Only moving part is ball bearing mounted rotor—no contacts or distributor to cause condensation and corrosion problems. And the MGC's big capacity spells better ignition *all ways*.

You can have this greater capacity for long-term, trouble-free operation . . . Specify the American Bosch Pulse Generator System for all large stationary gas engines. American Bosch, Springfield 7, Massachusetts.

AMERICAN BOSCH



Automotive and Aviation Magnetos

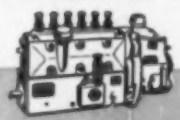


Generators and Regulators

Components for Aircraft Engines

Electric Wipers and Small Motors

Ignition Coils



Diesel Fuel Injection Equipment

PIPE LINE INDUSTRY

CONSTRUCTION
OPERATIONS
MAINTENANCE

GASO PUMP PERFORMS *TRIPLE SERVICE* IN 60,000 BARREL UNDERGROUND STORAGE PLANT

ANCHOR PETROLEUM'S UNDERGROUND STORAGE PLANT near Bath, N. Y. The pumping unit consists of a Fig. 1742 2½" x 5½" x 10" Gaso Duplex Piston Power Pump driven by Model 145-GKU Waukesha Power Unit, complete with steel skids, V-Belt Drive and Guard. Capacity from 38 GPM to 330 GPM at pressures from 1400 to 500 pounds.

The flexibility of Gaso Pumping Units is dramatically demonstrated in the installation pictured above, one of several operated by Anchor Petroleum Company:

1. In less than 90 days, operating in winter weather, the Gaso Pump washed out salt formation to give Anchor a 60,000-barrel underground storage reservoir.

2. Since then the pump has been storing gas in the cavity at a rate of 300 GPM.

3. The same pump will be used to displace the gas for consumers' use. Interchangeability of liners assures maximum efficiency on all jobs.

WE ARE PUMPING SPECIALISTS READY ALWAYS TO HELP YOU IN YOUR PUMPING PROBLEMS

GASO PUMP & BURNER MFG. CO. TULSA, OKLAHOMA

EXPORT OFFICE: 149 Broadway, New York

LUFKIN MACHINE CO., Ltd., Edmonton, Alberta
W. L. SOMNER COMPANY, Shreveport, Louisiana
Tinsley, Mississippi • Brookhaven, Mississippi • Odessa, Texas
POWER PUMPS, INC., Long Beach, Calif.
PEDDLERS, INC., Houston, Texas
NORTEX ENGINE & EQUIPMENT CO., Wichita Falls, Texas
LUFKIN FOUNDRY & MACHINE CO., Casper, Wyoming

GASO PUMPS
for every oil industry need